A Marriage-Market Perspective on Risk-Taking and Career Choices

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Abstract

Women are less likely than men to be in "risky" occupations, that is, those that exhibit large within-occupation wage dispersion. We first demonstrate that a new theoretical channel—the competitive structure of the marriage market—may incentivize both men and women to choose riskier careers with lower wage returns. We then show that a unifying factor—women's relative inability to reap the benefits of a risky career due to their shorter reproductive span—can help rationalize a set of gender differences in labor-market and marriage-market outcomes. We provide evidence that supports the importance of the marriage market in risky career choices and their gender differences.

Keywords: marriage market, risk-taking, occupational choices, differential fecundity, gender

JEL: C78, J12, J16

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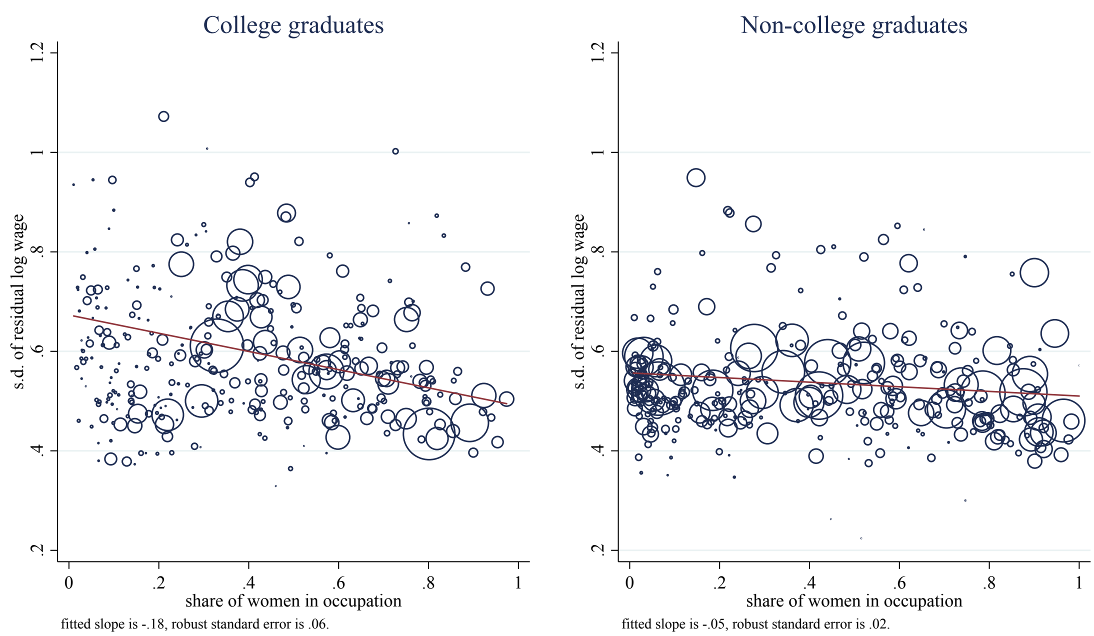
1 Introduction

Compared with men, women are systematically less likely to take risks (see Byrnes et al., 1999; Charness and Gneezy, 2012, for recent reviews). For example, studies in economics, psychology, and health consistently find that women are less likely to invest in risky assets (e.g., Cárdenas et al., 2012), engage in risky behavior (e.g., Rodham et al., 2005), and choose risky college majors (e.g., Patnaik et al., 2020).

This paper focuses on a less noticed aspect of gender difference in risk-taking: women are systematically less represented in risky occupations, where occupational riskiness is measured as the within-occupation wage inequality while adjusted for observable individual characteristics such as gender, age, and race. Figure 1 shows that within-occupation adjusted wage inequality is negatively associated with the share of female workers in that occupation. This negative correlation is stronger among college graduates than among noncollege graduates.

Figure 1: Occupation Wage Riskiness and Female Ratio



Note: The data is from the 5-year American Community Surveys (ACS) ending in 2016, representing 5% of the U.S. population. The sample includes those between ages 16 and 64 who are not currently enrolled in school and report a valid occupation. Separately for college graduates and noncollege graduates, log wage is first regressed against age and age squared, an indicator for gender, a set of race indicators, as well as the exhaustive interactive terms of the three sets of variables. Occupation wage riskiness is measured as the standard deviation of the residual log wage within the occupation. Each bubble in the graph represents an occupation defined by the IPUMS. The size of the bubble is proportional to the number of workers in the occupation for the specific skill group. The linear fit regression is weighted by the number of workers in the occupation for the specific skill group.

In this paper, we provide an explanation for the gender difference in risky occupational choices based on incentives from the marriage market. The choices of a career and a spouse are two of the most important decisions an individual could make, and the two decisions are clearly interlinked (e.g., Bursztyn et al., 2017; Gershoni and Low, 2021a). Numerous papers have proposed theories separately on the labor market (since Becker, 1964) and marriage market (since Becker, 1973, 1974), many have considered simultaneous labor and marriage market choices (Chiappori et al., 2009; Bhaskar and Hopkins, 2016). Yet, few consider the active choice of the level of uncertainty agents are exposed to.

We start by building a general-equilibrium marriage-market model where occupational choices are incentivized by prospects in the marriage market. While both men and women prefer a higher-income spouse, and choosing a risky career is a feasible way to edge out in the competitive marriage market. We show that the gender difference in fecundity (in addition to other gender differences) would discourage women from embarking on a risky career whose return is uncertain and takes time to realize. This mechanism may be particularly relevant for women with college and advanced degrees—by spending more years in school, they are more likely to face a binding biological clock—consistent with the motivating evidence presented in Figure 1.

Our model generates a rich set of predictions with regard to risk-taking and career choice patterns. First, it shows that due to the competitive nature of the marriage market, somewhat surprisingly, people may be more inclined to choose a *risky career* than a *safe career*, even if the risky career yields a *lower* expected income. Second, it predicts gender differences in premarital career choices. Women are less likely than men to choose risky careers, because it is more costly for them to wait for the outcome of a risky career. Third, because women are less likely to choose risky careers and are exposed to less income uncertainty, within-gender income inequality is also smaller for women. Fourth, since women systematically choose safer careers and their actual earnings realize early, they tend to marry earlier than men. Finally, women who choose risky occupations will marry later, and due to their shorter fertility span, are less likely to have children.

We test model predictions using data from the American Community Survey (Ruggles et al., 2017). We focus on individuals with college degrees because the model's mechanisms are more relevant for this group. Throughout the paper, we use the terms "occupation" and "career" interchangeably, implicitly assuming that the choice of an occupation is informative of one's career. We measure the riskiness of an occupation as the within-occupation log wage dispersion among middle-aged workers, for whom the wage uncertainty of the occupation likely has realized. To account for the possible correlation between an occupation's riskiness and its average wage, we control for the average demographic-characteristics-adjusted wage of the occupation throughout our empirical analyses.

Empirical evidence is consistent with model predictions. First, we show evidence that the share of people who choose risky occupations is positively associated with marriage market competitiveness. Then, we provide evidence on the gender differences. The share of women in risky occupations, defined as those with an above-median log wage dispersion, is between 6 and 9 percentage points lower than men. As a result, wage inequality among women is between 5 and 15 log points lower. For both men and women, those who choose risky occupations tend to marry later. Choosing a risky occupation is associated with fewer children for women, but not for men. We provide robustness checks using panel data from the National Longitudinal Study of Youth 1979 (NLSY79).

The paper makes three contributions. First, it incorporates risk-taking in a general equilibrium marriage-market framework. Although many papers based on general equilibrium marriage-market frameworks have studied how gender differences affect individuals' human capital investments and social roles (Bergstrom and Bagnoli, 1993; Siow, 1998; Iyigun and Walsh, 2007; Chiappori et al., 2009; Low, 2021; Wu and Zhang, 2021; Zhang, 2021), these papers do not consider how people voluntarily choose the *level of uncertainty* they are exposed to. This paper identifies surprising and important subtleties regarding the effects of the marriage market on risk-taking. The framework—with its endogenous determination of career choices, marriage timing, income distributions, marriage matching, and division of marriage surplus—enables us to derive a set of results that cannot be collectively explained by partial-equilibrium frameworks that are primarily constructed to empirically test specific theoretical channels.[1] Despite the model's complexity, we manage to keep it tractable and obtain closed-form solutions.

Second, the paper provides a new explanation of risk-taking based on the marriage market (Proposition 1). Many papers have provided explanations for why people take risks, including overconfidence and social status concerns (Smith, 1776; Becker et al., 2005), preferences for lotteries (Friedman and Savage, 1948; Friedman, 1953), subsistence concerns (Rubin and Paul, 1979), incentive to relocate (Rosen, 1997), and related to marriage market concerns, the role of polygamous marriages (Robson, 1992, 1996). This paper shows that competitiveness in the one-to-one matching market encourages risk-taking.[2]

Third, this paper uses a parsimonious assumption—that in the biological clock of producing offspring—to provide a unified explanation of a wide range of gender differences in premarital career choices, income inequality, timing of marriage, fertility decisions, and postmarital career choices (Propositions 2 to 5) using only a parsimonious assumption on gender difference. Our model, though simple and stylized, is able to shed light on a wide range of socioeconomic gender

[1]Previous partial-equilibrium frameworks focus on providing evidence that marital incentives affect education and labor supply decisions (Goldin and Katz, 2002; Bailey, 2006; Bertrand et al., 2010; Lafortune, 2013; Adda et al., 2017; Bronson, 2019), but few have focused on the effects of marital incentives on career choices.

[2]The channel highlighted in this paper is not restricted to marriage markets. Any competitively organized two-sided one-to-one matching market encourages risk-taking. In a complementary paper, which focuses on the implications of premarital career investments, Zhang (2020) elaborates on the theoretical argument that a competitive transferable-utilities matching market induces extreme gambles regardless of the shape of the surplus function, and investigates the multiplicities and inefficiencies of equilibrium investments in two-sided matching markets.

differences existent in the data and documented in existing empirical and experimental studies. Of course, we are not ruling out the role of gender differences along other dimensions in explaining those phenomena. Alternative explanations include gender differences in evolutionary biology, in psychological traits such as overconfidence, taste for risk, and attitudes towards competitiveness, and different social norms towards men and women.[3] The predictions and empirical evidence of the paper should be interpreted as complementary to these existing explanations.

The rest of the paper is organized as follows. Section 2 sets up the benchmark model and shows how the marriage market encourages risk-taking. Section 3 constructs a parametric generalization of the benchmark model to incorporate more gender differences and provide sharp testable predictions. Section 4 provides empirical evidence consistent with theoretical predictions. Section 5 concludes. Appendix A includes omitted model details and proofs.

2 Model

We start with the simplest model to demonstrate how people have a marriage-market incentive to choose a risky career. We will allow more gender differences in the more general model. Time is discrete and infinite: $t = 1, 2, \ldots$. At the beginning of each period, unit masses of men and women are born with heterogeneous *income-earning abilities* x_m and x_w, distributed according to continuous and strictly increasing mass distributions F_m and F_w with supports $X_m \equiv [\underline{x}_m, \overline{x}_m] \subset \mathbb{R}$ and $X_w \equiv [\underline{x}_w, \overline{x}_w] \subset \mathbb{R}$.[4] Men and women make career and marriage decisions over the next two periods, described below and illustrated in Figure 2.

2.1 Model

2.1.1 Career Choices

Each agent chooses a *safe career* or a *risky career* at the beginning of the first period of their life. The safe career compensates a person's human capital with certainty: An ability-x_m man who chooses a safe career receives an income $y_m = x_m$, and an ability-x_w woman who chooses a safe career receives an income $y_w = x_w$. In contrast, the risky career noisily compensates a person's human capital: An ability-x_m man who chooses a risky career receives an income $y_m = x_m + \varepsilon_m$,

[3]Previous studies have investigated gender differences in competitiveness (e.g., Niederle and Vesterlund, 2007; Kleinjans, 2009; Buser et al., 2014; Gill and Prowse, 2014; Wozniak et al., 2014), in risk preferences and beliefs (e.g., Altonji and Blank, 1999; Eckel and Grossman, 2002; Barbulescu and Bidwell, 2012; Koellinger et al., 2013; Zafar, 2013; Patnaik et al., 2020; Wiswall and Zafar, 2021), in genetic features (e.g., Dreber and Hoffman, 2007), and in gender social norms (e.g., Bursztyn et al., 2017).

[4]All results will continue to hold assuming gender imbalance: Unproductive individuals can be added to the short side of the market to restore gender balance.

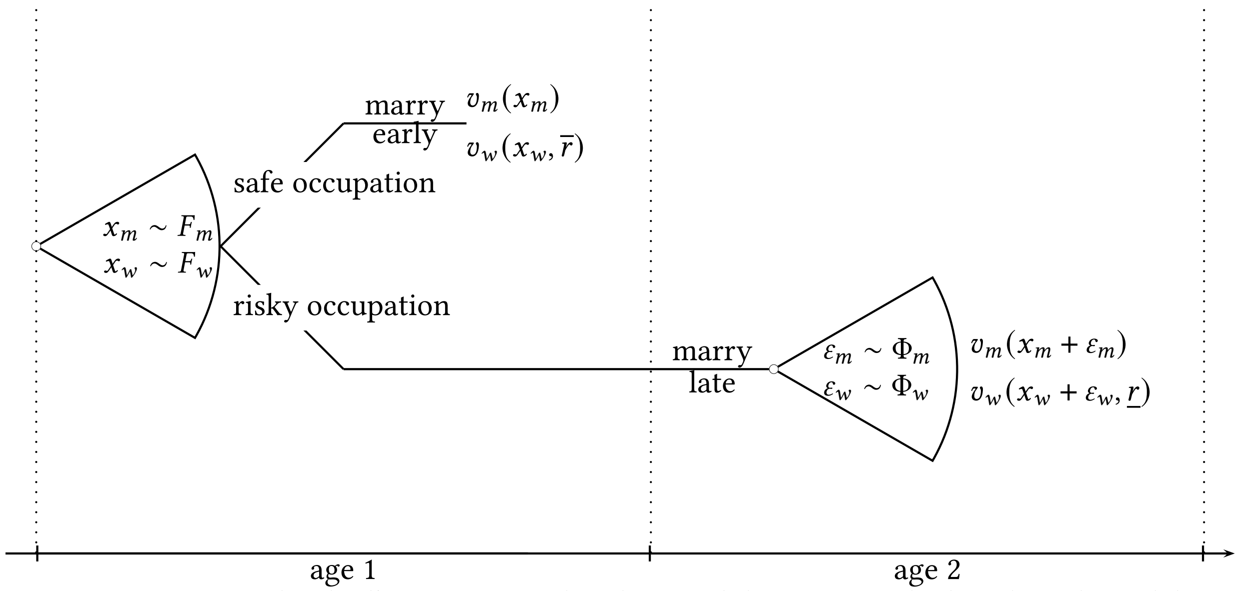


Figure 2: An individual's occupational and marital decisions in the benchmark model.

where ε_m is distributed according to a cumulative distribution function $\Phi_m(\cdot|x_m)$, and an ability-x_w woman who chooses a risky career receives an income $y_w = x_w + \varepsilon_w$, where ε_w is distributed according to a cumulative distribution function $\Phi_w(\cdot|x_w)$.

In the benchmark model, suppose that a person who chooses the safe career enters the marriage market immediately in the current period, and a person who chooses the risky career waits until the income is realized in the next period to enter the marriage market. Later we will extend the model and allow separate career and marriage timing choices, but Proposition 5 shows that it is not desirable for a person who chooses the safe career to marry late or for a person who chooses the risky career to marry early, so it is without loss of generality to assume that an individual who chooses a risky career waits to marry and an individual who chooses a safe career marries immediately. Let $p_m(x_m)$ represent the probability that an ability-x_m man chooses a risky career, and $p_w(x_w)$ the probability that an ability-x_w woman chooses a risky career. Throughout the paper, we to use $p_m(\cdot)$ and $p_w(\cdot)$ to represent population strategies and p_m and p_w to represent individual strategies.

2.1.2 The Marriage Market

When women enter the marriage market late, they face a reproductive decline; but men do not. Namely, whereas men remain reproductively fit throughout the two periods, women who enter the marriage market early are reproductively fit ($r = \overline{r}$), but women who enter the marriage market late are less fit ($r = \underline{r} < \overline{r}$).[5]

[5]We choose to model reproductive fitness as an additional dimension of women's characteristics for generality, but it is qualitatively equivalent to simply assume that a woman incurs a cost when entering the marriage market

Career choices $p_m(\cdot)$ and $p_w(\cdot)$ lead to income distributions G_m and G_w for men and women, respectively. For any y_m, men with an income below y_m include those men who have an ability below y_m and choose the safe career and those men who choose the risky career and realize an income below y_m:

$$G_m(y_m|p_m(\cdot)) \equiv \int_{\underline{x}_m}^{y_m} [1 - p_m(x_m)]dF_m(x_m) + \int_{\underline{x}_m}^{\overline{x}_m} \Phi_m(y_m - x_m|x_m)p_m(x_m)dF_m(x_m). \quad (1)$$

Since women who choose a safe career and enter the marriage market in the first period are fit, the mass of fit women with an income below y_w is

$$G_w(y_w, \overline{r}|p_w(\cdot)) \equiv \int_{\underline{x}_w}^{y_w} [1 - p_w(x_w)]dF_w(x_w), \quad (2)$$

and the mass of less fit women with an income below y_w is

$$G_w(y_w, \underline{r}|p_w(\cdot)) \equiv \int_{\underline{x}_w}^{\overline{x}_w} \Phi_w(y_w - x_w|x_w)p_w(x_w)dF_w(x_w). \quad (3)$$

The lifetime marriage surplus an income-y_m man and an income-y_w woman with reproductive fitness r produce is $s(y_m, y_w, r)$. The lifetime marriage surplus can be thought of as the result of a household production problem in which the husband and the wife allocate their time and resources to the production of private goods and public goods, given their incomes and reproductive fitness; see Appendix A.1 for a household public good provision problem that justifies the use of specific surplus functions as well as transferable utilities. To focus on career choices, we also assume that the marriage surplus does not depend on when agents marry but only on agents' marital types. Normalize the surplus any unmarried agent produces to zero. Assume that the surplus function is twice differentiable in incomes, and is strictly increasing in each of the three arguments.

Men and women match and negotiate the division of their marriage surplus to reach a stable outcome in which no pair of a man and a woman could strictly improve their payoffs in the outcome. Formally:

Definition 1. *A* stable outcome *of the marriage market characterized by income distributions* (G_m, G_w) *consists of a* matching G *and* marriage payoff functions $(v_m(\cdot), v_w(\cdot,\cdot))$ *such that*

1. *Stable matching* $G(y_m, y_w, r)$ *describes the mass of couples with incomes lower than* y_m *and* y_w *such that the marginals of* G *are* G_m *and* G_w.

late. In the parameterized version of the model we present later, women's reproductive dimension is conveniently collapsed so that each woman is represented by a single index that encompasses income and reproductive fitness.

2. *Stable marriage payoffs* $v_m(y_m) \geq 0$ *and* $v_w(y_w, r) \geq 0$ *satisfy the following two stability conditions:*

   (a) *Every couple divides the marriage surplus: For any* (y_m, y_w, r) *in the support of* G, $v_m(y_m) + v_w(y_w, r) = s(y_m, y_w, r)$.

   (b) *No division of surplus could make any unmatched pair of man and woman strictly better off: For any* (y_m, y_w, r), $v_m(y_m) + v_w(y_w, r) \geq s(y_m, y_w, r)$.

By Theorem 2 of Gretsky et al. (1992), a stable outcome exists.

2.1.3 Payoffs

Each person is risk neutral and does not discount. A person's payoff is simply their marriage payoff. That is, an income-y_m man's payoff is $v_m(y_m)$, and an income-y_w woman's payoff is $v_w(y_w, \bar{r})$ if she marries in the first period of her life, or $v_w(y_w, \underline{r})$ if she marries in the second period. An ability-x_m man's expected payoff from strategy p_m when men's marriage payoff is $v_m(\cdot)$ is

$$u_m(p_m, x_m|v_m(\cdot)) \equiv p_m\mathbb{E}\left[v_m(x_m + \varepsilon_m)|x_m\right] + (1 - p_m)v_m(x_m), \tag{4}$$

and an ability-x_w woman's expected payoff from strategy p_w when women's marriage payoff is $v_w(\cdot, \cdot)$ is

$$u_w(p_w, x_w|v_w(\cdot, \cdot)) \equiv p_w\mathbb{E}\left[v_w(x_w + \varepsilon_w, \underline{r})|x_w\right] + (1 - p_w)v_w(x_w, \bar{r}). \tag{5}$$

2.2 Equilibrium

In summary, the model's primitives are (i) ability distributions $F_m(\cdot)$ and $F_w(\cdot)$; (ii) income distributions from a risky career for each individual, $\Phi_m(\cdot|\cdot)$ and $\Phi_w(\cdot|\cdot)$; and (iii) the marriage surplus function $s(\cdot, \cdot, \cdot)$. Hence, $(F_m, F_w, \Phi_m, \Phi_w, s)$ summarizes the model. An equilibrium of the model is defined as follows. In the equilibrium, each agent chooses the career that maximizes their expected marriage payoff, and the marriage payoffs are the stable marriage payoffs in the marriage market induced by agents' career choices. Formally:

Definition 2. $(p_m^*(\cdot), p_w^*(\cdot), G_m^*, G_w^*, G^*, v_m^*, v_w^*)$ *is an* equilibrium *of* $(F_m, F_w, \Phi_m, \Phi_w, s)$ *if*

1. $p_m^*(x_m)$ *maximizes an ability-*x_m *man's expected payoff when men's marriage payoff is* $v_m^*(\cdot)$*:*

$$p_m^*(x_m) \in \underset{p_m \in [0,1]}{\arg\max}\; u_m(p_m, x_m|v_m^*(\cdot)) \quad \forall x_m \in X_m,$$

and $p_w^*(x_w)$ maximizes an ability-x_w woman's expected payoff when women's marriage payoff is $v_w^*(\cdot)$:

$$p_w^*(x_w) \in \underset{p_w \in [0,1]}{\arg\max}\ u_w(p_w, x_w | v_w^*(\cdot)) \quad \forall x_w \in X_w.$$

2. *Men's income distribution $G_m^*(\cdot)$ is induced by men's career choices $p_m^*(\cdot)$:*

$$G_m^*(y_m) = G_m(y_m | p_m^*(\cdot)) \quad \forall y_m,$$

and fit and less fit women's income distributions $G_w^*(\cdot, \overline{r})$ and $G_w^*(\cdot, \underline{r})$ are induced by women's career choices $p_w^*(\cdot)$:

$$G_w^*(y_w, r) = G_w(y_w, r | p_w^*(\cdot)) \quad \forall y_w.$$

3. *(G^*, v_m^*, v_w^*) is a stable outcome of the marriage market (G_m^*, G_w^*).*

Theorem 1. *An equilibrium exists.*

We apply Glicksberg's fixed-point theorem to prove equilibrium existence. Multiple equilibria may arise, with a similar reasoning as in coordination problems; we provide an example in Appendix A.3. In Section 3, we use a parameterized model with a unique equilibrium to derive additional implications. The generalized model also extends the benchmark model by allowing gender-differential risk preferences and endogenous costs of choosing different careers. Before we turn to the parametric model, we use the benchmark model to demonstrate how the marriage market encourages risk-taking, and how this marriage-market incentive for risk-taking is independent of parametric assumptions.

2.3 Risk-taking due to Marriage-market Incentives

In the remainder of the section, we highlight an inherent force in the competitive marriage market that encourages risk-taking. When the forces against risk-taking (concretely, concavity of the surplus function in the benchmark model and risk aversion and additional costs in the extension) are not strong enough, the market force that encourages risk-taking dominates and manifests in people's choice of a risky career with a low expected income and a high income variance, *without* relying on risk-loving preferences.

To understand this inherent market force that drives risk-taking, we must emphasize the competitive organization of the marriage market. The key property of the competitive marriage market is that *each person marries the partner that maximizes their marriage payoff.* To understand this key property, consider the division of the marriage surplus in the marriage market.

First, when an income-y_m man marries a woman with characteristics $z_w(y_m)$, he and the woman divide up their marriage surplus: $v_m(y_m) + v_w(z_w(y_m)) = s(y_m, z_w(y_m))$. In other words, an income-y_m man gets a payoff that is the total surplus he and a $z_w(y_m)$ woman generate net the $z_w(y_m)$ woman's payoff:

$$v_m(y_m) = s(y_m, z_w(y_m)) - v_w(z_w(y_m)). \tag{6}$$

Second, given women's stable marriage payoff schedule $v_w(\cdot)$, no woman can form a pair with a man and improve both of their payoffs. In other words, the total hypothetical surplus the man and any other woman generate must be lower than the sum of the payoffs they are getting in their current stable outcome. Mathematically,

$$v_m(y_m) + v_w(z_w) \geq s(y_m, z_w) \quad \forall z_w \neq z_w(y_m).$$

From a man's private perspective, his current payoff is better than the hypothetical payoff he could get by marrying any other type of woman:

$$v_m(y_m) \geq s(y_m, z_w) - v_w(z_w) \quad \forall z_w \neq z_w(y_m). \tag{7}$$

The two stability conditions (Equations 6 and 7) together yield

$$v_m(y_m) = s(y_m, z_w(y_m)) - v_w(z_w(y_m)) \geq s(y_m, z_w) - v_w(z_w) \quad \forall z_w \neq z_w(y_m), \tag{8}$$

that is, each man's marriage payoff is the most he can get given women's marriage payoff schedule; a man is married to the wife that maximizes his marriage payoff. There is no restriction for a man to marry any woman, as long as he is willing to give a woman her stable marriage payoff (or any payoff above it). However, the deduction above shows that he has no strict incentive to marry anyone other than his partner in the stable outcome, because that partner provides him the highest marriage payoff given women's stable marriage payoff schedule.

How does this property encourage risky career choices? Consider the following example to see this effect in isolation. Suppose the marriage surplus is linear in the man's income, and an ability-$\widetilde{y}_m$ man chooses between a safe career and a risky career whose income realization is simply a mean-preserving spread of the income obtained from the safe career. If the man always marries the same type $z_w = (y_w, r)$ woman regardless of his income realization y_m, his payoff is $v_m(y_m|z_w) = s(y_m, z_w) - v_w(z_w)$, depicted by a solid blue line in Figure 3. Since the income from the risky career is assumed to be a mean-preserving spread of the income $\widetilde{y}_m$ from the safe career, if a man were to always marry to a z_w woman, he will be indifferent between the risky career and safe career. However, the man marries the partner that gives him the highest payoff in the competitive marriage market, and that payoff-maximizing partner may not always be z_w. In fact, as Figure 3 illustrates, when he realizes an income higher than $\widetilde{y}_m$, he can achieve a better payoff by marrying z''_w than by marrying z_w; when he realizes an income lower than $\widetilde{y}_m$, he can still achieve a better payoff by marrying z'_w than by marrying z_w. Therefore, if there are three types of women in the marriage market, z_w, z'_w, and z''_w, men's marriage payoff schedule is the upper envelope of three lines, which is weakly convex. Furthermore, if there is a continuum of types of women, men's marriage payoff function $v_m(y_m)$, is strictly convex, as illustrated by Figure 4a. When the marriage payoff is strictly convex, the man has a strict incentive to choose the risky career as long as the risky career yields the same expected income as the safe career.

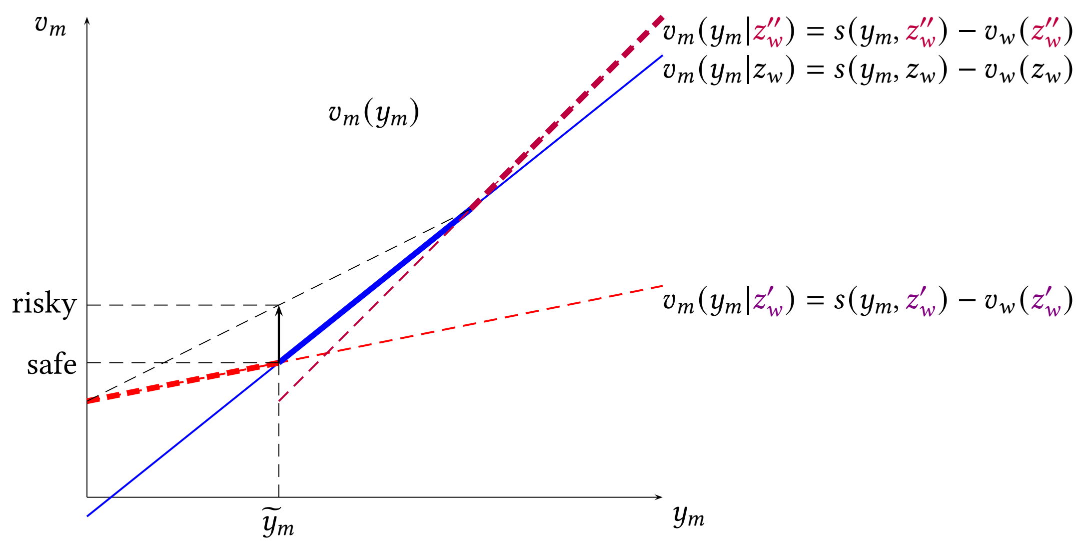
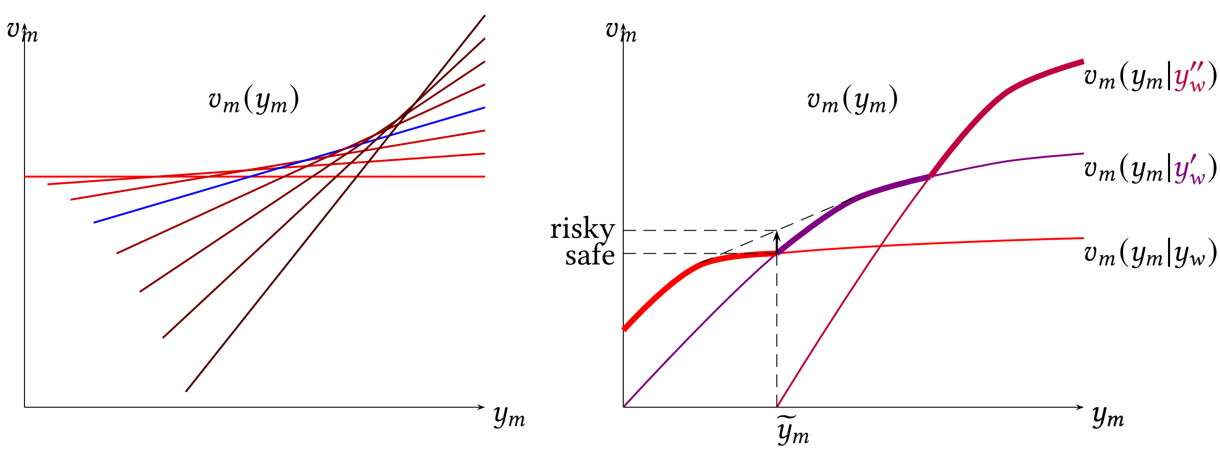


Figure 3: A linear surplus leads to a weakly convex payoff.



(a) A linear surplus and heterogeneity lead to a strictly convex payoff.

(b) A concave surplus can lead to a partially convex payoff.

Figure 4: Convex payoff

Therefore, when the marriage surplus is linear, men always choose a risky career if the risky career's income distribution is a mean-preserving spread of the safe career's, due to the incentives provided by the competitive marriage market.

Lemma 1. *If the marriage surplus is linear in the man's income and the risky career has the same expected income as the safe career, it is strictly dominant for each man to choose the risky career.*

When the surplus is linear and there is heterogeneity in types on the other side of the market, we show that the marriage payoff is strictly convex everywhere. When the surplus is concave, the marriage payoff is not strictly convex everywhere, but in certain ranges, the marriage payoff function may still be convex and people may still have a strict incentive to choose the risky career, even if the risky career has a lower expected income than the safe career (see Figure 4b).

Lemma 2. *An unmarried person might choose a career with a lower expected income and higher income uncertainty even if the marriage surplus function is strictly concave in income.*

This lemma helps to rationalize risky career choices without relying on risk preferences. A person can be justified in choosing a risky, badly paid career that has lower expected income and higher income variance, as long as he or she has marital concerns. As a result, anyone choosing a profession whose superstars are "overcompensated" may be well justified. Individuals facing such a wage structure may include actors, musicians, and lawyers. Previous papers have explained such risky choices by status concerns or overconfidence. This paper provides an additional explanation based on the marriage market.

Note that these arguments do not rely on the supermodularity of the surplus function. The surplus could have been strictly submodular (e.g., $s(y_m, y_w, r) = r(y_m + y_w - y_m y_w)$), and the force that encourages risk-taking would still hold. If a man chooses a risky career, compared with the women he would marry if he chooses a safe career, he would be marrying a *lower*-type woman when he realizes a higher income and a *higher*-type woman when he realizes a lower income—but nonetheless, these choices maximize his marriage payoff and convexify the payoff function.

In addition, the linearity of surplus in men's income is sufficient but not necessary for risk-taking. The key ingredient that drives the strict dominance of the risky career is the competitive nature of the marriage market. As Proposition 1 will show, agents may prefer risky careers even if they are risk-averse and the surplus function is strictly concave.

If women face a reproductive decline associated with choosing a risky career, even though women have the same marriage-market incentive that encourages risk-taking, their reproductive decline acts as an additional cost that deters them from choosing the risky career. Exactly how much women are deterred from the risky career is captured by the following extension of the benchmark model.

3 Gender Differences

In this section, we extend the benchmark model. We allow people to exhibit non-risk-neutral preferences. We also let the income realization from choosing a risky career depend on the percentage of other people in the economy who choose the same career. Furthermore, in the next section, we separate career choice and marriage timing (i.e., someone who chooses a risky career can also marry early). To keep the model tractable and derive closed-form solutions, we impose reasonable functional form assumptions on the income-earning ability distributions, the income distributions of the risky career, and the marriage surplus function.

Time is still discrete and infinite: $t = 1, 2, \ldots$. At the beginning of each period, a unit mass of men and unit mass of women, endowed with heterogeneous (log-income) abilities $x_m \sim N(\mu_{x_m}, \sigma^2_{x_m})$ and $x_w \sim N(\mu_{x_w}, \sigma^2_{x_w})$, choose between a safe career and a risky career. Anyone who chooses the safe career realizes their income and enters the marriage market in the current period, and anyone who chooses the risky career realizes their income and enters the marriage market in the next period.

3.1 Model

3.1.1 The Marriage Market

In the marriage market, men are distinguished by income only, but women are distinguished by income and reproductive fitness. Those women who enter the marriage market in the first period are more fit than those who enter in the second period. Namely, a log-income-y_m man and a log-income y_w and fitness r woman produce a marriage surplus

$$s(y_m, y_w, r) = \exp(\alpha_m y_m + \alpha_w (y_w - 1_{r=\underline{r}} k)) \equiv \exp(\alpha_m z_m + \alpha_w z_w).$$

The marriage surplus is a Cobb-Douglas function in marriage type. Note that the marriage surplus is strictly increasing and strictly supermodular in marriage types z_m and $z_w = y_w - 1_{r=\underline{r}} k$ as well as in log-incomes y_m and y_w.

In the marriage market, men and women frictionlessly match and bargain over the division of their marriage surplus until a stable outcome is reached. A stable outcome of the marriage market is described by stable matching distributions $z_m(\cdot)$ and $z_w(\cdot)$ that are feasible, as well as stable marriage payoff functions $v_m(\cdot)$ and $v_w(\cdot)$ such that (1) everyone gets a nonnegative payoff: $v_m(z_m) \geq 0$ and $v_w(z_w) \geq 0$ for all z_m and z_w; (2) every married couple divides the surplus: $v_m(z_m) + v_w(z_w(z_m)) = s(z_m, z_w(z_m))$ and $v_m(z_m(z_w)) + v_w(z_w) = s(z_m(z_w), z_w)$ for all z_m and z_w; and (3) no pair of man and woman who are not married to each other have an incentive to marry each other: $v_m(z_m) + v_w(z_w) \geq s(z_m, z_w)$ for all z_m and z_w.

Stable matching is positive assortative, because the surplus is strictly supermodular. Given the type distributions $N(\mu_{z_m}, \sigma_{z_m}^2)$ and $N(\mu_{z_w}, \sigma_{z_w}^2)$, if z_m and z_w are matched, $(z_m - \mu_{z_m})/\sigma_{z_m} = (z_w - \mu_{z_w})/\sigma_{z_w}$. From the stability conditions, we can also derive stable marriage payoff functions, summarized as follows.

Lemma 3. *Suppose marriage types are normally distributed $N(\mu_{z_m}, \sigma_{z_m}^2)$ and $N(\mu_{z_w}, \sigma_{z_w}^2)$. Stable matching functions are*

$$z_m(z_w) = \frac{\sigma_{z_m}}{\sigma_{z_w}}(z_w - \mu_{z_w}) + \mu_{z_m}, \quad \textit{and}$$

$$z_w(z_m) = \frac{\sigma_{z_w}}{\sigma_{z_m}}(z_m - \mu_{z_m}) + \mu_{z_w}.$$

Stable marriage payoff functions are

$$v_m(z_m) = \frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}} \exp(\alpha_m z_m + \alpha_w z_w(z_m)), \quad \textit{and}$$

$$v_w(z_w) = \frac{\alpha_w}{\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}} \exp(\alpha_w z_w + \alpha_m z_m(z_w)).$$

Since there is an equal mass of men and women in the marriage market, everyone marries immediately upon entering the marriage market, so from now on it is equivalent to say "to enter the marriage market" and "to marry."

3.1.2 Career Choices

A safe career yields an ability-x_m man a log-income $y_m = x_m$, and yields an ability-x_w woman a log-income $y_w = x_w$. A risky career yields an ability-x_m man a log-income $y_m = x_m - c + \varepsilon_m$, where c is a market-determined cost of taking the risky career, and $\varepsilon_m \sim N(t_m, s_m^2)$. Similarly, a risky career yields an ability-x_w woman a log-income $y_w = x_w - c + \varepsilon_w$, where $\varepsilon_w \sim N(t_w, s_w^2)$. The cost c depends on the mass of people choosing the risky career. The more people choose it, the higher the cost: $c'(p_m + p_w) > 0$.

Let $p_m(x_m)$ and $p_w(x_w)$ be an ability-x_m man's and an ability-x_w woman's probability of choosing the risky career, respectively. Proportion $p_m = \int_{-\infty}^{\infty} p_m(x_m) d\Phi(\frac{x_m - \mu_{x_m}}{\sigma_{x_m}})$ of men and proportion $p_w = \int_{-\infty}^{\infty} p_w(x_w) d\Phi(\frac{x_w - \mu_{x_w}}{\sigma_{x_w}})$ of women choose the risky career, where Φ is the standard normal cumulative distribution function. Since abilities are assumed to be normally distributed, men's income distribution is $LN(\mu_{y_m}, \sigma_{y_m}^2)$, where $\mu_{y_m} = \mu_{x_m} + p_m(t_m - c)$ and $\sigma_{y_m}^2 = \sigma_{x_m}^2 + p_m \frac{s_m^2}{2}$, and women's income distribution is $LN(\mu_{y_w}, \sigma_{y_w}^2)$, where $\mu_{y_w} = \mu_{x_w} + p_w(t_w - c)$ and $\sigma_{y_w}^2 = \sigma_{x_w}^2 + p_w \frac{s_w^2}{2}$.

Agents derive utility from stable marriage payoffs according to the following functions:

$$u_m(v_m) = \frac{{v_m}^{1-\rho_m}}{1-\rho_m} \quad \text{and} \quad u_w(v_w) = \frac{{v_w}^{1-\rho_w}}{1-\rho_w}.$$

When $\rho_m = \rho_w = 0$, men and women are risk-neutral, and when $\rho_m, \rho_w > 0$, men and women are risk-averse. we can now derive the optimal career choices.

Lemma 4. *Suppose marriage types are normally distributed $N(\mu_{z_m}, \sigma^2_{z_m})$ and $N(\mu_{z_w}, \sigma^2_{z_w})$. Let*

$$\delta_m \equiv t_m - c + (1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)\frac{s_m^2}{2},$$

and

$$\delta_w \equiv t_w - c - k + (1-\rho_w)\left(\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}\right)\frac{s_w^2}{2}.$$

Every man chooses the risky career if $\delta_m > 0$, the safe career if $\delta_m < 0$, and is indifferent between the risky career and the safe career if $\delta_m = 0$. Every woman chooses the risky career if $\delta_w > 0$, the safe career if $\delta_w < 0$, and is indifferent between the risky career and the safe career if $\delta_w = 0$.

The terms δ_m and δ_w are key to understanding the model. First, note that δ_m and δ_w do not depend on ability x_m and x_w: The incentive for choosing a risky career is the same for every man and for every woman. Second, decompose δ_m into the following three terms:

$$\delta_m = \left[t_m - c + \frac{s_m^2}{2}\right] + \left[((1-\rho_m)\alpha_m - 1)\frac{s_m^2}{2}\right] + \left[(1-\rho_m)\alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\frac{s_m^2}{2}\right].$$

The first term, $\left[t_m - c + \frac{s_m^2}{2}\right]$, is the difference in expected income between the risky career and the safe career. The second term, $\left[((1-\rho_m)\alpha_m - 1)\frac{s_m^2}{2}\right]$, is the expected gain in own payoff from choosing the risky career, *without* changing a marriage partner. If the marriage surplus is linear in the man's income and the man is risk-neutral, then this term is zero; if the marriage surplus is concave in the man's income and the man is risk-averse, then the term is negative. The third and final term, $\left[(1-\rho_m)\alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\frac{s_m^2}{2}\right]$, is the expected gain due to a changed partner in the marriage market. This term is positive regardless of the shape of the surplus function and the marriage-type distributions, as long as the man is not too risk-averse ($1-\rho_m > 0$) and there is some heterogeneity on the other side of the market ($\sigma_{z_w} > 0$). This third term is what drives risky career choices for moderately risk-averse agents.

The same decomposition can be done for δ_w.

$$\delta_w = -k + \left[t_w - c + \frac{s_w^2}{2}\right] + \left[((1-\rho_w)\alpha_m - 1)\frac{s_w^2}{2}\right] + \left[(1-\rho_w)\alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}\frac{s_w^2}{2}\right].$$

It has an additional term $-k$, which is the loss in payoff associated with declined reproductive fitness. All else equal, women have a lower expected gain from the risky career because of the reproductive fitness loss.

3.1.3 Equilibrium

Definition 3. $(p_m^*(\cdot), p_w^*(\cdot), v_m^*(\cdot), v_w^*(\cdot))$ *is an* equilibrium *if*

1. *$p_m^*(x_m)$ maximizes each ability-x_m man's expected utility, and $p_w^*(x_w)$ maximizes each ability-x_w woman's expected utility, given equilibrium marriage payoff functions $v_m^*(\cdot)$ and $v_w^*(\cdot)$ as well as market-determined cost $c^* = c(p_m^* + p_w^*)$, where*

$$p_m^* = \int_{-\infty}^{\infty} p_m^*(x_m) d\Phi((x_m - \mu_{xm})/\sigma_{xm}), \text{ and}$$

$$p_w^* = \int_{-\infty}^{\infty} p_w^*(x_w) d\Phi((x_w - \mu_{xw})/\sigma_{xw}).$$

2. *Equilibrium marriage payoff functions $v_m^*(\cdot)$ and $v_w^*(\cdot)$ are the stable marriage payoff functions of the marriage market with type distributions $N(\mu_{z_m}, \sigma_{z_m}^2)$ and $N(\mu_{z_w}, \sigma_{z_w}^2)$, where*

$$\mu_{z_m} = \mu_{y_m} + p_m(t_m - c), \quad \sigma_{z_m}^2 = \sigma_{y_m}^2 = \sigma_{x_m}^2 + \frac{p_m s_m^2}{2},$$

$$\mu_{z_w} = \mu_{y_w} + p_w(t_w - c - k), \quad \text{and} \quad \sigma_{z_w}^2 = \sigma_{y_w}^2 = \sigma_{x_w}^2 + \frac{p_w s_w^2}{2}.$$

Theorem 2. *An equilibrium exists, and exists uniquely if $\rho_m < 1$ and $\rho_w < 1$.*

3.2 Model Predictions

3.2.1 Risky Career Choice due to Marriage-market Incentives

The parameterized model helps determine exactly when a person prefers a risky career to a safe career, which provides sharper predictions than Lemmas 1 and 2.

Proposition 1. *Between a safe career and a risky career that returns lower expected income, a man would strictly prefer the risky career if $(1 - \rho_m)(\alpha_m + \alpha_w \frac{\sigma_{y_w}}{\sigma_{y_m}}) > 1$.*

A risk-neutral man ($\rho_m = 1$) would strictly prefer the risky career if the marriage surplus is linear in men's income ($\alpha_m = 1$). Furthermore, risk-averse agents may choose risky careers, and if the setting is gender-symmetric except for reproductive cost k, then women are less likely to choose the risky career. The gender difference in the two expressions is $2k/s_w^2$. That is, the higher reproductive cost and *lower* income variance of the risky career render women less inclined to choose a risky career.

The competitive nature of the marriage market encourages both men and women to engage in risk-taking behavior. The more competitive the marriage market becomes, the more likely men and women are to choose risky careers. In particular, the higher the variance of the income distribution of the *opposite* sex in his/her marriage market, the more likely he/she is to choose a risky career.

3.2.2 Gender Difference in Risky Career Choice and Income Dispersion

For the following propositions, we suppose ability distributions and career opportunities are gender-symmetric ($\sigma^2_{x_m} = \sigma^2_{x_w} \equiv \sigma^2_x$, $s_m = s_w \equiv s$, and $t_m = t_w \equiv t$).

The result whereby women are less likely than men to choose a risky career continues to hold in the general equilibrium. Note that the result is shown to hold unambiguously when there is complete gender symmetry in the model. By continuity, the result continues to hold when there is moderate gender asymmetry.

Proposition 2. *Men are more likely than women to choose the risky career.*

Experimental evidence shows that gender differences in attitude toward risk can explain about a quarter of gender differences in occupational choices. A laboratory experiment conducted by Jung et al. (2018) captures the income uncertainty aspect of the risky choice in our model and supports the prediction regarding the gender difference. Subjects chose between a risky job and a secure job that involved the same task (typing). The risky job was not available in any given period with a known probability, but also paid more in order to compensate for the uncertainty. Women were more likely than men to select the secure job (accounting for 40 percent to 77 percent of the gender wage gap in the experiments).

Because women are less likely to choose a risky career, consequently, unmarried women's income inequality is less than unmarried men's. Moreover, the disparity in the income inequality increases if the reproductive cost increases, if the risk aversion increases, or if the risky career becomes more uncertain.

Proposition 3. *Variance in (log) earnings is greater for men than for women ($\sigma^{*2}_{y_m} > \sigma^{*2}_{y_w}$).*

Note that for this result we do not need to assume that the ability distributions are gender-symmetric. For *any* underlying ability distributions, we will obtain the result whereby men's income inequality is larger than women's, as long as there is a reproductive difference. Furthermore, comparative statics suggest that the ratio of the log-income variances, $\sigma^{*2}_{y_m}/\sigma^{*2}_{y_w}$, increases in career cost k, increases in risk aversion R, decreases in the risky career's log earnings variance s^2, increases in α_w if the ratio is smaller than 2, and decreases in α_w if the ratio is bigger than 2.

3.2.3 Gender Differences in Marriage Timing

In the basic model, career and marital choices are connected: Risky career investors marry late, and safe career investors marry early. We separate career and marital choices in this section. There are four possible choices as a result: (1) choosing the safe career and marrying early, (2) choosing the safe career and marrying late, (3) choosing the risky career and marrying early with unresolved uncertainty in incomes, and (4) choosing the risky career and marrying late with resolved uncertainty in incomes.

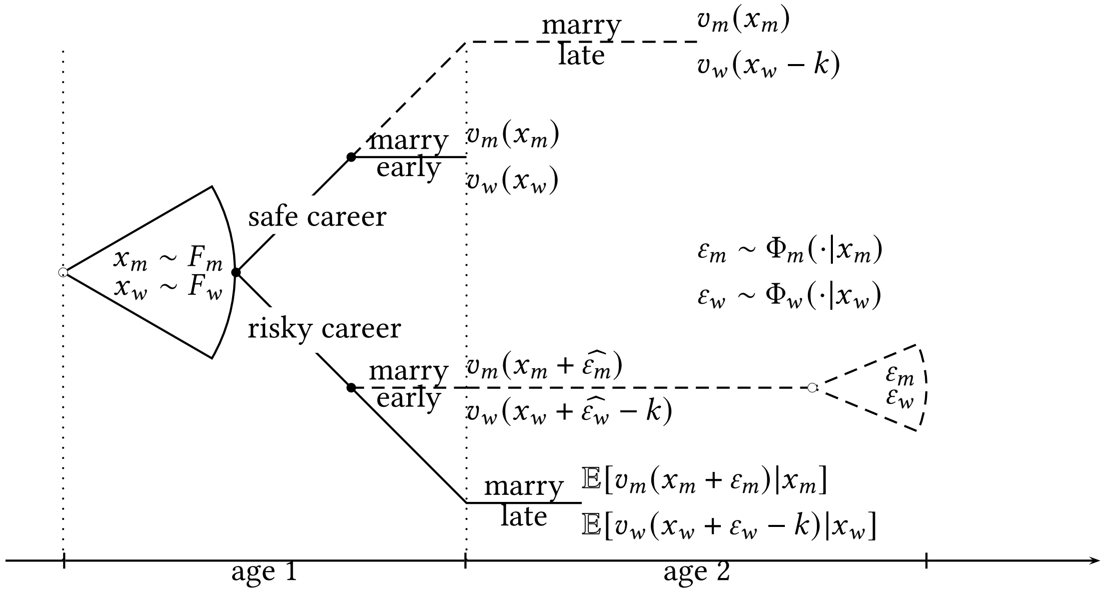


Figure 5: An individual's career and marriage decision tree in the parametric extension.

Suppose men and women can choose when to marry. Namely, an ability-x_m man who chooses the safe career can choose to marry in the second period as a marriage type $z_m = x_m$, and an ability-x_w woman who chooses the safe career can choose to marry in the second period as a marriage type $z_w = x_w - k$. An ability-x_m man can choose the risky career and marry in the first period as a man who may realize a marriage type $z_m = x_m - c + \varepsilon_m$ where $\varepsilon_m \sim N(t_m, s_m^2/2)$. If he marries a marriage type z_w woman and realizes an income $x_m - c + \varepsilon_m$, they generate a marriage surplus $s(x_m - c + \varepsilon_m, z_w)$. Similarly, an ability-$x_w$ woman can choose the risky career and marry in the first period as a woman who may realize a marriage type $z_w = x_w - c - k + \varepsilon_w$. We show that even if marriage timing is separated from the career choice, anyone who chooses the safe career tends to marry in the first period and anyone who chooses the risky career tends to marry in the second period, as we have assumed throughout the paper.

Lemma 5. *Career choice and marriage age are related: (i) Anyone who chooses the safe career marries in the first period, and (ii) anyone who chooses the risky career marries in the second period.*

To understand the result, realize that a person who has an incentive to choose a risky career only has the incentive to do so if he or she can marry to a different partner depending on the realization of their income from the risky career. For an ability-x_m man, the four choices respectively yield: (1) $v_m(x_m)$; (2) $v_m(x_m)$; (3) $v_m(x_m+\widehat{\varepsilon_m}|x_m)$; and (4) $\mathbb{E}[v_m(x_m+\varepsilon_m)|x_m]$, where $v_m(x_m+\widehat{\varepsilon_m}|x_m)$ represents the marriage payoff of an ability-x_m man who chooses the risky career. First, there is no advantage in choosing the safe career and marrying late over choosing the safe career and marrying early, since delaying is always associated with some costs and/or discounting; when a man chooses the safe career, he might as well choose to marry early.

Proposition 4. *Women marry earlier than men on average.*

Proposition 4 predicts that men marry later than women on average. In the United States, men have always married later than women on average. The same pattern holds around the world: Men have married later on average than women in every country in the world in recent decades (United Nations, 1990; Bergstrom and Bagnoli, 1993; United Nations, 2000).[6]

Marrying at an older age means less time to have children. Since women have shorter span of fecundity, those who marry later are more likely to be constrained by the biological clock. We thus have the following prediction from the model:

Corollary. *Women who choose a risky career are less likely to have children. This correlation is weaker for men.*

4 Empirical Evidence

This section presents empirical patterns on marriage and occupational choices that are consistent with model predictions. The empirical evidence presented here should be interpreted as correlations instead of causal effects, and we do not intend to rule out alternative explanations. A formal test of the model predictions needs exogenous shock of women's fecundity, which is beyond the scope of this paper.[7] Nevertheless, put together, these pieces of evidence suggest that the mechanisms implied by our model are viable explanations of salient features of gender differences in occupational choices and marital outcomes.

[6] This paper yields the same result as Bergstrom and Bagnoli (1993), but through a different channel. In their paper, there is asymmetric information about men's true abilities in their youth. Therefore, higher-ability men choose to marry later to reveal their true abilities. In this paper, there is no asymmetric information. Men and possibly women choose to delay marriage to potentially change their income.

[7] Recent studies have used regulations on in vitro fertilization (IVF) to study the role of lengthened fecundity on women's education and career choices (e.g., Kroeger and La Mattina, 2017; Gershoni and Low, 2021a,b). Kroeger and La Mattina (2017) exploit variation in state mandate on insurance coverage of IVF and find that women in states with IVF mandates are more likely to obtain a professional degree. We tried to use the same variation, but did not have enough statistical power for our outcome of interest.

4.1 Data and Sample

We use the five-year American Community Survey (ACS, Ruggles et al., 2017) ending in 2016 for most of the empirical tests. The dataset is a 5% random sample of the U.S. population. It has detailed information on respondents' occupation, work and income, education, marital outcomes, and other demographics. Although it is a five-year sample, it should be seen as providing a snapshot of the U.S. population.

We focus on the subsample of people who have college degrees. With four more years in school, these people face a more acute trade-off between family and career in a shortened time span, so the mechanisms highlighted in our model are likely more relevant, as is evident from Figure 1. In addition, college-educated workers have a larger variation in their income than less-educated workers. This is partly because college-educated workers possess a wider range of different skills, which is due to different career choices earlier in life, either at the time when deciding the focus of study in college or in early career.

We further restrict the sample to include individuals between ages 25 and 64 who are not currently enrolled in school or live in quarter groups. We start the sample at age 25 to allow people to finish college and settle into a stable job. Because our measure of career riskiness is based on occupation, the sample is further restricted to those who report a valid occupation code. In the ACS, this excludes people who have not worked in the past 5 years. In various cases we need the average and standard deviation of wage of a certain demographic group. To calculate wage rate, we use individuals who have positive earnings in the past year and worked at least half time (more than 20 hours in a typical week and more than 30 weeks in the past year). Hourly wage is calculated as the annual earning in the previous year divided by the product of weeks worked last year and usual hours worked per week.

4.2 Measuring Occupation Riskiness

Measuring the riskiness of a career is key to our empirical tests. We use one's occupation as a proxy for one's career, and measure career riskiness using the within-occupation standard deviation of residual log wage among workers between 40 and 49 years old. We use wage rate in one's 40s as a measure of one's "permanent wage," when the uncertainty about how much one can make in a given occupation is likely resolved. The wage dispersion captures how much risk in earnings potential a given occupation poses. Our results are robust to the choice of specific age groups to calculate wage dispersion. We use hourly wage instead of earnings to abstract away from endogenous labor supply decisions.

We adjust the wage rate based on observable individual characteristics, so the wage dispersion we use is not affected by different demographic compositions across different occupations.

Specifically, we first run the following equation:

$$\ln w_i = \mathbf{X}_i \cdot \beta + \varepsilon_i, \tag{9}$$

where $\mathbf{X}_i$ includes age and age squared, an indicator for gender, indicators for whether the person is white, black, Asian or of other race, and full interactions among those three sets of variables. Residual from the regression, $\hat{\varepsilon}_i$, captures the log point deviation from the average adjusted wage. Occupational riskiness is measured as the standard deviation of the residual log wage:

$$OccRisk_o = \sqrt{\frac{1}{N_o}\sum_{i\in o}(\hat{\varepsilon}_i - \bar{\hat{\varepsilon}}_o)^2}, \tag{10}$$

where $\bar{\hat{\varepsilon}}_o$ is the average residual log wage of the occupation, and N_o is the total number of workers in occupation o. Because $\hat{\varepsilon}_i$ takes the log point form, $OccRisk_o$ is comparable across occupations with different average wage levels. Both the regression and the construction of riskiness are weighted by the ACS person weight.

Table 1 lists the most and least risky occupations, among the top 50 most popular occupations of college-educated workers.[8] Among the most risky occupations are various sales jobs, whose earnings are highly associated with performance, as well as some professional occupations such as lawyers, financial specialists, and physicians. Among the least risky occupations are various professionals in education, as well as nurses and pharmacists. These are consistent with the conventional wisdom with regard to which occupations have higher or lower earnings inequality.

There is substantial variation in occupational riskiness. The standard deviation of log residual wage in the most risky occupation (real estate sales) is more than twice that in the least risky occupation (pharmacists). Men are more likely in risky occupations while women are more likely in less-risky ones: Men are dominant in 8 out of top 10 most risky occupations, while women are dominant in 8 out of top 10 least risky occupations. In the full sample of occupations, we call an occupation "risky" if its $OccRisk_o$ is above the median.

One issue with the definition is the measurement error in occupation classification. We use more than 300 3-digit occupations defined by the IPUMS. However, it is inevitable that some occupations are cruder and include a larger set of heterogeneous professions. For example, one may argue that "physicians" include a large set of medical professionals whose differentiated skills are valued differently in the labor market; in contrast, "primary school teachers" are more homogeneous. It is thus not surprising that there is a larger wage inequality among physicians than among primary school teachers. Our model relies on the assumption that choosing an occupation bears the uncertainty of its future wage. However, while we as econometricians do not

[8] In our analyses, we use all 328 occupations classified by IPUMS.

Table 1: Most and Least Risky Popular Occupations

Occupation	% in skilled workers	% male	$OccRisk_o$	$\bar{\bar{\varepsilon}}_o$
Panel A: Most risky occupations				
Real estate sales occupations	0.93	49.77	0.86	-0.14
Insurance sales occupations	0.49	61.37	0.80	0.03
Lawyers	2.06	59.27	0.78	0.5
Retail sales clerks	1.17	52.93	0.78	-0.36
Supervisors and proprietors of sales jobs	2.73	62.62	0.77	-0.08
Chief executives and public administrators	1.91	74.18	0.75	0.48
Other financial specialists	1.4	61.89	0.73	0.27
Physicians	1.73	60.41	0.73	0.87
Nursing aides, orderlies, and attendants	0.74	23.27	0.71	-0.64
Management analysts	1.23	56.25	0.71	0.24
Panel B: Least risky occupations				
Managers in education and related fields	1.69	38.5	0.48	0.01
Police, detectives, and private investigators	1.13	80.58	0.47	-0.01
Physical therapists	0.47	32.17	0.46	0.12
Computer software developers	2.44	78.01	0.46	0.25
Registered nurses	3.96	12.96	0.46	0.17
Primary school teachers	7.52	20.14	0.44	-0.25
Special education teachers	0.48	13.44	0.44	-0.2
Secondary school teachers	1.51	40.84	0.43	-0.25
Social workers	1.31	18.29	0.43	-0.23
Pharmacists	0.5	37.11	0.42	0.49

Note: Only including top 50 most popular occupations for college-educated workers.

observe a young medical student choosing to specialize in pediatrics or in anesthesiology,[9] it is arguably observable to their potential partners in the marriage market. It is difficult to gauge measurement errors in occupation classification, but we are not aware of any evidence that systematically broader sets of skills are canned in male-dominant occupations.

A risky career in the model does not only mean that the *realized* return is more dispersed, but it also requires *time* for the uncertainty to unravel. Intuitively, if the return of risky occupation is realized instantly, women's shorter span of fecundity should not impose as a disadvantage. Our measure of occupation riskiness only looks at wage dispersion in midlife, but if the risk has unravelled early on, potential partners can make marriage-market decisions based on one's realized income and there is no need to wait until the next period. Therefore, wage dispersion needs to be both large and increasing for an occupation to be regarded as risky in our setting.

[9]According to the Occupational Outlook Handbook published by the Bureau of Labor Statistics, general pediatricians have an average annual wage of $184,410 while anesthesiologists on average makes $261,730 a year.

Risky occupations, defined as wage dispersion for workers between 40 and 49 years old, also have larger wage dispersion for younger workers. Wage dispersion in both risky and less-risky occupations grows over time, but the growth is much higher in risky occupations: The average standard deviation of residual log wage in less risky occupations increases from 0.45 for workers between 25 and 29 to 0.49 for workers between 45 and 49; among risky occupations, average standard deviation increases from 0.53 to 0.7. In fact, the correlation coefficient between log wage dispersion among workers between 40 and 49 and the *growth* in log wage dispersion is about 0.7. About 80% of risky occupations by our definition also have a growth in log wage dispersion that is above the median. Our empirical results are also robust to alternative definitions of risky occupations that take into consideration both mid-life wage dispersion and growth in wage dispersion.

4.3 Other Occupation Characteristics

Residual log wage variation can be correlated with other occupational characteristics. It is possible that women are under-represented in some occupations not because these occupations exhibit large wage uncertainty, but because they have certain disamenities that are particularly costly for women.

While it is impossible to measure all possible occupational characteristics, we construct proxy variables for a few that have shown to be particular relevant for women. In the empirical analyses below, we control for proxies for these occupational amenities and show that residual wage variation remains to have power in explaining gender differences in occupation choices.

First, it is worth pointing out that risky occupations do not necessarily pay better or worse. The average residual log wage, $\bar{\hat{\varepsilon}}_o$, and riskiness $OccRisk_o$ are only weakly correlated, with a correlation coefficient of around 0.1. We can control for average residual log wage of an occupation.

Women are often the tied mover in family migration decisions (Mincer, 1978). Expecting possible future moves, it is possible for women to sort into geographically flexible jobs, so that they can find similar jobs no matter where they move (Benson, 2014). Teachers and physicians are needed everywhere, while demand for nuclear physicists are more geographically concentrated. And we definitely see more women making up a larger fraction in teachers and doctors than in nuclear physicists. We can measure the geographical flexibility of an occupation using the dis-similarity index:

$$D_o = \frac{1}{2}\sum_c \left|\frac{E_{oc}}{E_o} - \frac{E_c}{E}\right|,$$

where E_{oc} is the number of workers in occupation o in local labor market c (we use commuting zones). E_o is the total number of workers in occupation o. E_c is the total number of workers in labor market c. E is the total number of workers. If occupation o is evenly distributed across space, D_o is 0. A smaller D_o indicates the spatial distribution is more evenly distributed.

Recent studies have shown that job flexibility is particularly important for women's careers. (Goldin, 2014; Goldin and Katz, 2016) While job flexibility is a broad term that includes many job arrangements, one important aspect of job inflexibility is long working hours. We measure the premium of long working hours as a proxy for job inflexibility. If a job rewards long working hours, it is likely unfavorable to women as they, shouldering a larger proportion of housework, are less able to work long hours. We define long hours as working more than 50 hours per week. The long-hour premium for each occupation is defined as the log wage premium of those who work long hours compared with those who work full time, controlling for other demographic characteristics.

An important factor for women's careers and labor force participation is the presence of young children at home. We construct a measure of an occupation's friendliness towards female workers with young children that is based on revealed preference. If an occupation is good for women with young children, then we will see its share in women's employment increase from women without young children to women with young children, relative to men. The measure is:

$$\ln\left(\frac{E_{o,w}^{no\ kid}/E_{w}^{no\ kid}}{E_{o,w}^{kid}/E_{w}^{kid}}\right) - \ln\left(\frac{E_{o,m}^{no\ kid}/E_{m}^{no\ kid}}{E_{o,m}^{kid}/E_{m}^{kid}}\right),$$

where $E_{o,s}^{no\ kid}$, $s \in \{men, women\}$ is the employment of sex s with no young children in occupation o, while $E_{o,s}^{kid}$ is those with young children. $E_{s}^{no\ kid}$ is the total employment of sex s with no children. We construct this index using working men and women between age 25 and 44. A young child is defined as a child under 6 years old. We call this index the "mom-friendliness index."

Table 2: Correlations of Occupational Characteristics

	(1)	(2)
	share of female workers	=1 if risky occ.
spatial dis-similarity index	-0.49	-0.20
long-hour premium	-0.06	0.01
"mom-friendliness index"	0.27	-0.02

Note: Each observation is an occupation. See text for detailed definitions of occupation characteristics.

Column 1 of Table 2 shows the correlation coefficients between occupational characteristics and share of female workers in the occupation. Spatial concentration (larger spatial dis-similarity index) is negatively correlated with the female share, so is long-hour premium. Our reveal-preference-based mom-friendliness index is positively correlated with female share. Column 2 shows the correlation between our measure of occupation riskiness and other characteristics. Risky occupations tend to be *less* spatially concentrated, less mom-friendly, but more likely to have long-hour premium.

4.4 Empirical Patterns Consistent with Model Predictions

4.4.1 Marriage Market Incentives and Risky Career Choice

The marriage market has been shown to have an impact on people's career choices (Angrist, 2002; Lafortune, 2013). Surveys also show that men and women choose careers taking marriage into consideration (Patnaik et al., 2020; Wiswall and Zafar, 2021). Our theory provides another explanation for the association between the marriage market and the labor market. The competitive nature of the marriage market encourages both men and women to engage in risk-taking behavior (Proposition 1). The more competitive the marriage market becomes, the more likely men and women are to choose risky careers. Consider a woman, if the variation in wage among men in the marriage market is larger, given that the marriage surplus is linear in husband income, the woman has a stronger incentive to choose a risky occupation. This is because a linear surplus leads to a weakly convex payoff (Lemma 1). The same is true for a man. Similarly, a larger variation in wage among those of the same sex will also lead to stronger incentive to choose a risky occupation.

To test Proposition 1, we exploit variation in the competitiveness across *local* marriage markets. We measure own- and opposite-sex wage dispersion among those between 40 and 49 years old, and investigate their impacts on choices of risky occupations among those between 25 and 34 years old. We choose to measure wage dispersion among an older generation to avoid mechanical correlations—with a larger fraction of people choosing risky occupations, wage dispersion will naturally be greater. We assume that the inequality among the older generation is the relevant information for the younger generation: earnings potentials have not been realized for their contemporaries, the younger generation evaluates the conditions of local marriage market by observing the realized wage inequality among the older generation in the same marriage market.

We use Metropolitan Statistical Areas (MSAs) as local marriage markets. We focus on the 50 largest MSAs.[10] Columns 1 and 2 of Table 3 show that both own- and opposite-sex wage dispersion among ages 40-49 workers are positively associated with the fraction of ages 25-34 workers in risky occupations. In addition, men's occupational choice seems to be more sensitive to marriage market competitiveness.

[10] This restriction is largely due to sample size concerns. Outside of the top 50 MSAs, there are typically fewer than 100 observations to calculate wage dispersion for a gender-age-group bin among the college graduates.

Table 3: Wage Inequality and Occupational Choice

	(1)	(2)	(3)	(4)
	share in risky occupations		Δshare in risky occupations	
	ACS 2016		Census 2000, ACS 2016	
	male	female	male	female
opposite-sex log res. wage dispersion	0.432	0.308		
	(0.138)	(0.105)		
own-sex log res. wage dispersion	0.512	0.293		
	(0.157)	(0.158)		
Δ opposite sex log res. wage dispersion			0.224	0.053
			(0.099)	(0.099)
Δ own sex log res. wage dispersion			0.028	0.028
			(0.112)	(0.112)
opposite-sex mean log res. wage	X	X		
own-sex mean log res. wage	X	X		
Δ opposite sex mean log res. wage			X	X
Δ own sex mean log res. wage			X	X
N of MSAs	50	50	50	50

Note: Data include the 5-year ACS ending in 2016 and 5% sample of 2000 population census. The dependent variable, the share (or change in share) of workers in risky occupations, is constructed from ages 25–34. The main explanatory variables, (changes in) opposite- and own-sex wage dispersion, are constructed from ages 40–49. Robust standard errors in parentheses.

One may be concerned that some unobserved features of the MSA drive this correlation. In Columns 3 and 4 we investigate the correlation between *changes* in wage dispersion and *changes* in the share of risky occupational choices between 2000 and 2016. Time-invariant unobservable features of an MSA are eliminated in this long-differenced specification. The results still hold: MSAs that experienced larger increases in wage dispersion in own and the opposite sexes among the 40-49 year old also saw larger shares of the younger generation choosing risky occupations. The coefficients are smaller than those in Columns 1 and 2, rendering some of the coefficients not statistical significant at conventional levels. This is probably due to the fact that log difference increases the relative share of measurement error and exacerbates the attenuation bias.[11]

4.4.2 Gender Difference in Risky Occupational Choice and Wage Dispersion

Table 4 shows evidence that is consistent with Proposition 2. Column 1 shows that male workers are 7.6 p.p. more likely to be in a risky occupation. Columns 2 to 6 show that this pattern holds

[11]Admittedly, there are other important caveats before one is willing to take the results in Columns 3 and 4 as causal effects. For example, a sectoral shift in an MSA's economy can contribute to both an increase in wage inequality and a larger share of workers in risky occupations.

as we add additional occupational characteristics in the regression. Our preferred specification is Column 6, which shows that male workers are 4.2 p.p. more likely to be in a risky occupation than female workers. The pattern is similar for those who are never married (Column 7).

Table 4: Risky Occupational Choice by Sex

dep var: = 1 if in a risky occ.	(1)	(2)	(3)	(4)	(5)	(6)	(7) single
= 1 if male	0.076	0.074	0.114	0.036	0.048	0.042	0.039
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
occupational characteristics							
avg. log residual wage		0.033	-0.028	-0.024	-0.013	-0.081	-0.164
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
spatial dis-similarity index			-1.707			-0.882	-0.843
			(0.009)			(0.010)	(0.017)
long-hour premium				2.260		2.087	1.917
				(0.007)		(0.007)	(0.012)
"mom-friendly index"					-0.274	-0.181	-0.150
					(0.003)	(0.003)	(0.005)
individual chars.	X	X	X	X	X	X	X
N of obs.	929923	929913	929913	929913	929913	929913	338435

Note: Individual characteristics include age, race dummies, and their interactions. The sample includes men and women between ages 25 and 39 who report an occupation. 59% of men in the sample are in risky occupations. Robust standard errors are in parentheses.

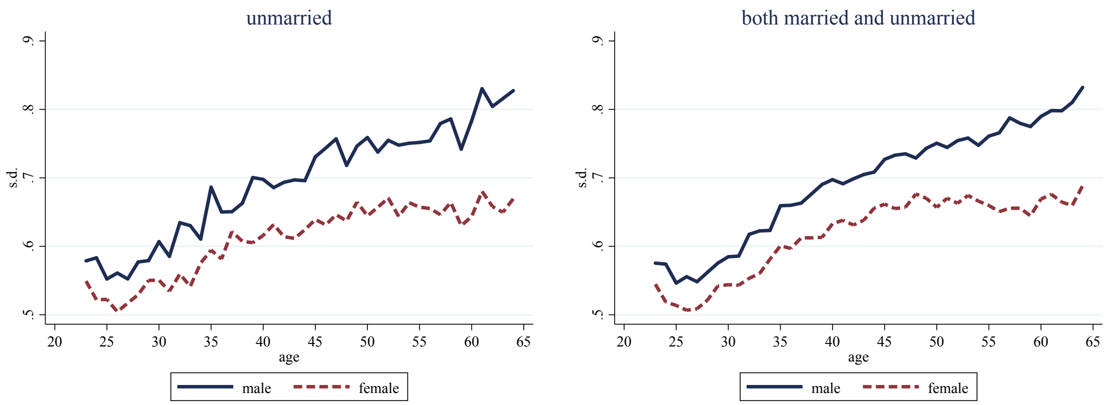
The first part of Proposition 3 predicts that because men are more likely in risky occupations than women, wage inequality is greater among men. Panel A of Figure 6 shows that indeed log residual wage dispersion is larger among men than among women at any given age, regardless of marital status. The figures also show that wage inequality for both men and women increases by age. According to the classical human capital theory, this is because of different choices in human capital accumulation: those who receive more on-the-job training have a steeper age-wage profile (Ben-Porath, 1967). Although not mutually exclusive with the classical human capital theory, our model indicates an alternative interpretation: choices of riskier careers lead to larger inequality in the future. Indeed, not only men's wage inequality is larger than that of women's at any given age, the gender gap in wage inequality increases by age. This is consistent with the fact that a larger fraction of men choose risky careers whose payoffs only realize years later.

4.4.3 Gender Difference in Marriage and Fertility

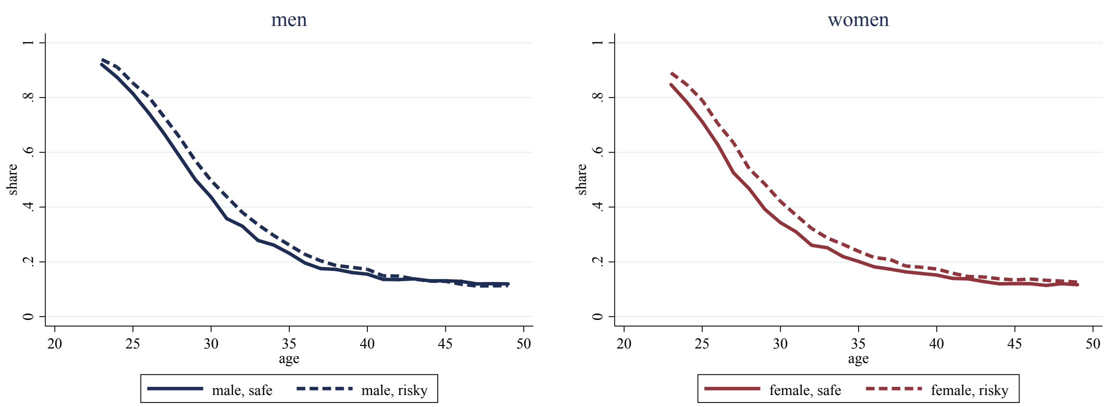
Lemma 5 predicts that those who choose risky occupations marry later. Panel B of Figure 6 plots the share of never married by age, separately for men and women, and confirms this prediction.

Figure 6: Wage Dispersion by Age and by Gender

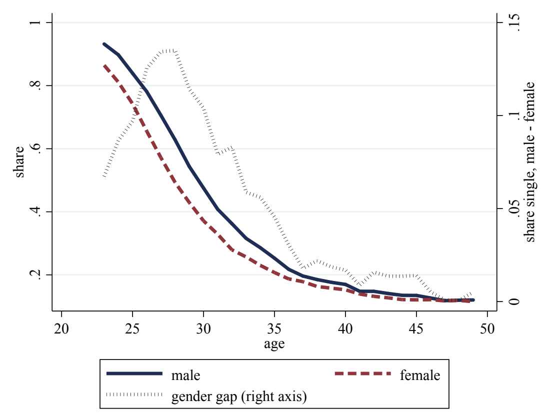
Panel A: Residual log wage dispersion by gender



Panel B: Share never married by occupational riskiness and age



Panel C: Share never married by age



Note: Data is from 5-year ACS ending in 2016. Panel A includes men and women between 25 and 64 who have college degrees, not currently enrolled in school, not living in group quarters, employed last year and working more than 20 hours/week. Panels B and C include men and women between 25 and 49 who have college degrees.

Proposition 4 further predicts that due to shorter reproductive span, women tend to marry earlier than men. This is a phenomenon widely observed across different cultures and over time. Panel C of Figure 6 shows that this pattern also holds for the US data. Columns 1 and 2 of Table 5 show that by age 50, women in a risky occupation are less likely to be never married, but not for men in those occupations.

Table 5: Occupation Choice and Marital Outcomes

	(1)	(2)	(4)	(5)
dep var:	= 1 if never married		= 1 if have children	
	women	men	women	men
= 1 if in risky occ.	0.008	0.003	-0.013	0.005
	(0.003)	(0.003)	(0.004)	(0.004)
individual chars	X	X	X	X
occupational chars	X	X	X	X
N of obs.	149764	143789	159484	150616
mean dep. var.	0.11	0.11	0.69	0.71

Note: Data is from 5-year ACS ending in 2016. Sample includes men and women with college degrees ages characteristics: age, race dummies, and interactive terms. Occupational characteristics include mean residual log wage, the spatial dissimilarity index, long-hour wage premium, and an index measuring the occupation's overall friendliness towards women with young children.

As a corollary of Proposition 4, the choice of risky occupations delays marriage, which affects the probability of having children. For men, because their fecundity span is longer, marrying at an older age has a smaller effect on the probability of having children. In contrast, the time window for women to finish college, succeed in a risky occupation, get married, and having children is tighter given their shorter fertility period, so we would expect that women who choose risky occupations are less likely to have children. Columns 3 and 4 of Table 5 supports this proposition.

4.5 Evidence from NLSY79

The ACS has a large sample and rich demographic information, but it is a cross-sectional dataset. Many of our model's predictions are sequential in nature—decisions today have consequences for outcomes later in life. Correlating the current occupation with current labor market and marriage market outcomes, as we have been doing so far, makes an implicit assumption that people do not switch occupations. To address this concern, we show the robustness of our results using the National Longitudinal Survey of Youth 1979 (NLSY79), taking advantage of its panel structure.

The NLSY79 surveys a sample of individuals born between 1957 and 1964. The survey started in 1979 and followed these individuals every year before 1997, and and every other year since 1997. The survey asks a wide range of questions, tailored in each wave as the respondents grew older. One drawback of the NLSY79 is its smaller sample size. It started with 12 thousand respondents, among those about 3,500 went on to obtain college degrees. By year 2000, about 60% of the respondents were still in the sample. Partly due to the much smaller sample size compared with the ACS, our estimates are less precise in some specifications.

We measure risky occupational choice as whether the person is in a risky occupation by age 30 and investigate the person's marriage and fertility outcomes later in life.[12] We always control for log earnings at age 30 (plus one to include zero). We restrict the sample the same way as for the 2016 ACS sample.

Table 6: Early-career Risky Occupation Choice and Marital Status Later in Life

	(1)	(2)	(3)	(4)	(5)	(6)
dep var	= 1 if married by age 40		# of children in hhd. by age 40		biological children	
					#	had any
	women	men	women	men	women	women
= 1 if in risky occ by age 30	-0.034	-0.024	-0.201	-0.058	-0.165	-0.079
	(0.029)	(0.035)	(0.093)	(0.110)	(0.099)	(0.032)
ln income by age 30	-0.009	0.023	-0.097	0.085	-0.084	-0.015
	(0.004)	(0.009)	(0.015)	(0.021)	(0.018)	(0.004)
year of birth FE	X	X	X	X	X	X
occ. chars.	X	X	X	X	X	X
age when last surveyed					X	X
ind. demo.	X	X	X	X	X	X
# of ind.	1265	1027	1152	940	1190	1190
mean dep. var.	0.76	0.77	1.56	1.34	1.70	0.76

Note: Sample includes men and women with college degrees in the NLSY79. Robust standard errors in parentheses. All regressions include a set of year of birth fixed effects, individual demographic characteristics (black, Hispanic, or non-black and non-Hispanic), other occupational characteristics, and are weighted by sample weights. Other occupational characteristics include mean residual log wage, the spatial dissimilarity index, long-hour wage premium, and an index measuring the occupation's overall friendliness towards women with young children.

The first two columns of Table 6 show choosing a risky occupation in early career delays marriage, but more so for women. Women in risky occupations in early career are 3.4 p.p. less likely to be married by age 40, while men are 2.4 p.p. less likely, although the coefficients are not statistically significant. We control for birth year fixed effects and a set of individual demographic characteristics as well as additional occupational characteristics.

The remainder of Table 6 shows the correlation between risky occupation choice in early

[12]NLSY79 uses different occupational codes across different waves, so we map occupational codes used in the NSLY79 into IPUMS occupational codes (occ1990) following Deming (2017). We then use the occupation riskiness defined using data from the 2016 ACS. Ideally we would like to measure riskiness by future wage dispersion given early-career occupational choice. But the sample size in NLSY79 is too small to calculate wage dispersion by early-career occupational choice.

career and fertility outcomes later. Columns 3 and 4 show that choosing a risky occupation in early career reduces the number of children in household (both biological or non-biological) by age 40. But the effect is much larger for women (by 0.2 or about 13% of the sample mean) than for men (0.06 or about 4% of the sample mean). The effect on men is also not statistically significant.

One advantage of the NLSY79 is that in waves after 2000 (respondents were between 36 and 43 years old in 2000), it asked female respondents how many biological children they ever had. Columns 5 and 6 investigate the correlation between risky occupational choice and the number and probability of having biological children. To maximize the sample size, we use the information on biological children from the last year a woman was surveyed. We control for the age when the last interview was conducted, to account for the fact that some women were older when they were last interviewed, and are likely to report more children than those whose last interview was at an early age. As before, we also control for birth cohort fixed effects, log income at age 30, log average occupation residual wage, and a set of other individual demographic characteristics. Choosing a risky occupation in early career is associated with a decline of 0.165 (10% of the sample mean) of the women's life-time number of biological children and a decline of the probability of having any biological children by 7.9 p.p. (10% from the mean). These are significant effects, both statistically and economically.

5 Conclusion

We embed the discussion of gender-differential risky career choices in a general equilibrium marriage-market framework. A set of outcomes is simultaneously and endogenously determined: career choices, marriage timing, income distributions, matching between couples, and the division of marriage payoffs. First, we find that the competitive organization of the marriage market inherently induces both men and women to choose risky careers. Second, we find women's shorter reproductive span, which imposes a gender-asymmetric career cost, to be a potential unifying factor to explain gender differences in premarital career choices, income inequality, marriage age, and fertility decisions.

We use both cross-sectional and longitudinal data from the United States to document patterns consistent with model predictions. We use these empirical findings to show that our model's capabilities of explaining a wide range of stylized facts with regard to labor and marriage markets. Most of the patterns documented in the paper should be interpreted as correlations instead of causalities, and we do not intend to rule out alternative explanations. An interesting extension for future work along the empirical aspect of this paper is to unpack such a causal relationship.

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Appendix

A Omitted Details and Proofs

A.1 A Microfoundation of the Marriage Surplus Function

Consider a man with realized income y_m and a woman with realized income y_w. A single person's utility depends on the consumption of a public good and a private good: $u_m(Q, q_m) = q_m Q$ and $u_w(Q, q_w) = q_w Q$. They divide their incomes between the two goods to maximize their respective utility. The utility when they live alone are their reservation utility $z_m(y_m) = \max_Q (y_m - Q)Q = (y_m/2)^2 = {y_m}^2/4$ and $z_w(y_w) = \max_Q (y_w - Q)Q = {y_w}^2/4$, respectively. The maximal total utility when the two marry (or live together) subject to the constraint $Q + q_m + q_w = y_m + y_w$ is

$$z(y_m, y_w) = \max_{Q, q_m, q_w} q_m Q + q_w Q = \max_Q (y_m + y_w - Q)Q = (y_m + y_w)^2/4.$$

The sum of private goods is determinate to be $q_m + q_w = (y_m + y_w)/2$, but the allocation of private goods q_m and q_w is indeterminate. The surplus from the marriage of a couple (y_m, y_w) is hence

$$s(y_m, y_w) = z(y_m, y_w) - z(y_m) - z(y_w) = y_m y_w/2.$$

The marital surplus is perfectly transferable between the two parties: To achieve a marital gain of v_m in combination with the reservation utility, the man consumes a private good of $q_m = [v_m + z(y_m)]/Q = 2[v_m + {y_m}^2/4]/(y_m + y_w)$. Similarly, the woman consumes a private good of $q_w = [v_w + z(y_w)]/Q = 2[v_m + {y_w}^2/4]/(y_m + y_w)$ to achieve a marital gain of v_w.

A.2 Proof of Theorem 1

Consider the following composite map

$$\Gamma : \mathcal{V} \rightrightarrows P_m \times P_w \to \mathcal{G}_m \times \mathcal{G}_w \rightrightarrows \mathcal{V},$$

where $\mathcal{V}$ is the set of stable marriage payoff functions $v_m : X_m \to \mathbb{R}_+$ and $v_w : X_w \to \mathbb{R}_+$, $P_m \times P_w$ is the set of career choice strategies $p_m : X_m \to [0, 1]$ and $p_w : X_w \to [0, 1]$, and $\mathcal{G}_m \times \mathcal{G}_w$ is the set of income distributions. By Glicksberg's fixed-point theorem, an equilibrium exists if $\mathcal{V}$ is non-empty, convex, and compact, and Γ is non-empty-valued, upper-hemicontinuous, convex-valued, and compact-valued. These properties are satisfied in this setting.

A.3 An Example with Multiple Equilibria

Suppose men and women all have abilities of 2. Each person can choose either a safe career that returns 2, or a risky career that returns 1 with probability 1/2 and 3 with probability 1/2. The surplus function is $s(y_m, y_w) = y_m y_w$. There are two equilibria in this setting. Everyone chooses the safe career in an equilibrium in which $v_m^*(1) = v_w^*(1) = 0.5$, $v_m^*(2) = v_w^*(2) = 2$, and $v_m^*(3) = v_w^*(3) = 4$. Everyone chooses the risky career in another equilibrium in which $v_m^*(2) = v_w^*(2) = 0.5$, $v_m^*(2) = v_w^*(2) = 2$, and $v_m^*(2) = v_w^*(2) = 4.5$.

A.4 Proof of Lemma 3

Fix a z_m. From the stability conditions

$$v_m(z_m) = s(z_m, z_w(z_m)) - v_w(z_w(z_m))$$

$$v_m(z_m) \geq s(z_m, z_w) - v_w(z_w) \quad \forall z_w,$$

we have

$$v_m(z_m) = \max_{z_w} s(z_m, z_w) - v_w(z_w)$$

$$z_w(z_m) \in \arg\max_{z_w} s(z_m, z_w) - v_w(z_w).$$

By the envelope theorem,

$$v_m'(z_m) = \frac{\partial s(z_m, z_w(z_m))}{\partial z_m} + \left(\frac{\partial s(z_m, z_w(z_m))}{\partial z_w} - v_w{}'(z_w(z_m)) \right) \frac{\partial z_w}{\partial z_m}.$$

By the fact that

$$z_w(z_m) \in \arg\max_{z_w} s(z_m, z_w) - v_w(z_w),$$

We know

$$\frac{\partial s(z_m, z_w(z_m))}{\partial z_w} - v_w{}'(z_w(z_m)) = 0.$$

Therefore,

$$v_m'(z_m) = \frac{\partial s(z_m, z_w(z_m))}{\partial z_m} = \frac{\partial(\exp(\alpha_m z_m + \alpha_w z_w(z_m)))}{\partial z_m} = \alpha_m \exp(\alpha_m z_m + \alpha_w z_w(z_m)).$$

Then

$$v_m(z_m) = \int_{-\infty}^{z_m} \alpha_m \exp\left(\alpha_m \widetilde{z}_m + \alpha_w \left(\frac{\sigma_{z_w}}{\sigma_{z_m}} (\widetilde{z}_m - \mu_{z_m}) + \mu_{z_w} \right) \right) d\widetilde{z}_m$$

$$=\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}} \exp(\alpha_m z_m + \alpha_w z_w(z_m)).$$

Similarly,

$$v_w(z_w) = \frac{\alpha_w}{\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}} \exp(\alpha_w z_w + \alpha_m z_m(z_w)).$$

A.5 Proof of Lemma 4

An ability-x_m man's expected utility gain from the risky career over the safe career is

$$\begin{aligned}\Delta_m(x_m) =& \mathbb{E}_{\varepsilon_m}\left[u_m(v_m(x_m - c + \varepsilon_m))\right] - u_m(v_m(x_m)) \\ =& \mathbb{E}_{\varepsilon_m}\left[u_m(v_m(x_m - c + \varepsilon_m)) - u_m(v_m(x_m))\right],\end{aligned}$$

where

$$\begin{aligned}& u_m(v_m(x_m - c + \varepsilon_m)) - u_m(v_m(x_m)) \\ = \quad & \frac{1}{1-\rho_m}\left(\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}}\right)^{1-\rho_m} \times \mathbb{E}_{\varepsilon_m}[\exp((1-\rho_m)(\alpha_m(x_m - c + \varepsilon_m) + \\ & \alpha_w z_w(x_m - c + \varepsilon_m))) - \exp((1-\rho_m)(\alpha_m x_m + \alpha_w z_w(x_m)))] \\ = \quad & \left(\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}}\right)^{1-\rho_m} \frac{\exp[(1-\rho_m)(\alpha_m x_m + \alpha_w z_w(z_m))]}{1-\rho_m} \times \\ & \mathbb{E}_{\varepsilon_m}\left[\exp\left((1-\rho_m)(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}})(\varepsilon_m - c)\right) - 1\right].\end{aligned}$$

Since $\mathbb{E}_{\varepsilon_m}[\exp(\alpha\varepsilon_m)] = \exp(\alpha t_m + \alpha^2 s_m^2/2)$, the expected value of the term in the square brackets becomes

$$\exp\left((1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)(t_m - c) + \left((1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)\right)^2 \frac{s_m^2}{2}\right) - 1.$$

Therefore,

$$\begin{aligned}& \Delta_m(x_m) \\ = \quad & \left(\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}}\right)^{1-\rho_m} \frac{\exp[(1-\rho_m)(\alpha_m x_m + \alpha_w z_w(x_m))]}{1-\rho_m} \times \\ & \left(\exp\left((1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)\left(t_m - c + (1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)\frac{s_m^2}{2}\right)\right) - 1\right),\end{aligned}$$

and $\Delta_m(x_m)$ has the same sign as

$$\delta_m \equiv t_m - c + (1-\rho_m)\left(\alpha_m + \alpha_w \frac{\sigma_{z_w}}{\sigma_{z_m}}\right)\frac{s_m^2}{2}.$$

Similarly, an ability-x_w woman's expected utility gain from the risky career over the safe career, $\Delta_w(x_w) \equiv \mathbb{E}_{\varepsilon_w}[u_w(v_w(x_w - c - k + \varepsilon_w))] - u_w(v_w(x_w))$, is

$$\left(\frac{\alpha_w}{\alpha_w + \alpha_m \frac{\sigma_{zm}}{\sigma_{zw}}}\right)^{1-\rho_w} \frac{\exp[(1-\rho_w)(\alpha_w x_w + \alpha_m z_m(x_w))]}{1-\rho_w} \times$$
$$\left(\exp\left((1-\rho_w)\left(\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}\right)\left(t_w - c - k + (1-\rho_w)\left(\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}\right)\frac{s_w^2}{2}\right)\right) - 1\right),$$

and $\Delta_w(x_w)$ has the same sign as

$$\delta_w \equiv t_w - c - k + (1-\rho_w)\left(\alpha_w + \alpha_m \frac{\sigma_{z_m}}{\sigma_{z_w}}\right)\frac{s_w^2}{2}.$$

Without the marriage market. An ability x_m man's expected utility gain from the risky career over the safe career, *without the marriage market*, is

$$\Delta_m(x_m) = \mathbb{E}_{\varepsilon_m}[u_m(s(x_m - c + \varepsilon_m, z_w(x_m)) - v_w(z_w(x_m)) - u_m(v_m(x_m))],$$

where

$$\begin{aligned}
& u_m(s(x_m - c + \varepsilon_m, z_w(x_m)) - v_w(z_w(x_m)) - u_m(v_m(x_m)) \\
= \; & \frac{[s(x_m - c + \varepsilon_m, z_w(x_m)) - v_w(z_w(x_m))_+]^{1-\rho_m}}{1-\rho_m} - \frac{[v_m(x_m)]^{1-\rho_m}}{1-\rho_m} \\
= \; & \frac{\left[\exp[\alpha_m(x_m - c + \varepsilon_m) + \alpha_w z_w(x_m)] - \frac{\alpha_w}{\alpha_w + \alpha_m \frac{\sigma_{zm}}{\sigma_{zw}}} \exp[\alpha_m x_m + \alpha_w z_w(x_m))]\right]^{1-\rho_m}}{1-\rho_m} \\
& - \frac{\left[\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{zw}}{\sigma_{zm}}} \exp(\alpha_m x_m + \alpha_w z_w(x_m))\right]^{1-\rho_m}}{1-\rho_m} \\
= \; & \frac{\left[\left[\exp[\alpha_m(\varepsilon_m - c)] - \frac{\alpha_w}{\alpha_w + \alpha_m \frac{\sigma_{zm}}{\sigma_{zw}}}\right] \exp[\alpha_m x_m + \alpha_w z_w(x_m))]\right]^{1-\rho_m}}{1-\rho_m} \\
& - \frac{\left[\frac{\alpha_m}{\alpha_m + \alpha_w \frac{\sigma_{zw}}{\sigma_{zm}}} \exp(\alpha_m x_m + \alpha_w z_w(x_m)\right]^{1-\rho_m}}{1-\rho_m}
\end{aligned}$$

$$= \quad \frac{\exp[(1-\rho_m)(\alpha_m x_m + \alpha_w z_w(x_m))]}{1-\rho_m} \left[(\exp[\alpha_m \varepsilon_m - \alpha_m c] - K)_+^{1-\rho_m} - (1-K)^{1-\rho_m} \right],$$

where $K = \frac{\alpha_w \sigma_{z_w}}{\alpha_w \sigma_{z_w} + \alpha_m \sigma_{z_m}}$. It remains to calculate

$$\begin{aligned}
& \mathbb{E}_{\varepsilon_m} \left[(\exp[\alpha_m(\varepsilon_m - c)] - K)^{1-\rho_m} - (1-K)^{1-\rho_m} \right] \\
= \; & \int [\exp(\alpha_m \varepsilon_m - \alpha_m c)]^{1-\rho_m} \frac{1}{\sqrt{2\pi s_m^2}} \exp\left(-\frac{(\varepsilon_m - t_m)^2}{2 s_m^2} \right) d\varepsilon_m \\
= \; & \mathbb{E}_{\varepsilon_m}[\exp[(1-\rho_m)\alpha_m(\varepsilon_m - c)]] \\
= \; & \exp\left[(1-\rho_m)\alpha_m(t_m - c) + \frac{(1-\rho_m)^2 {\alpha_m}^2 s_m^2}{2} \right] \\
= \; & \exp\left[(1-\rho_m)\alpha_m \left(t_m - c + (1-\rho_m)\alpha_m \frac{s_m^2}{2} \right) \right].
\end{aligned}$$

Since $\varepsilon_m \sim \mathcal{N}(t_m, s_m^2)$, $\alpha_m \varepsilon_m - \alpha_m c \sim \mathcal{N}(\alpha_m(t_m - c), {\alpha_m}^2 s_m^2)$.

$$z_w(z_m) = \frac{\sigma_{z_m}}{\sigma_{z_w}}(z_m - \mu_{z_m}) + \mu_{z_w}.$$

□

With the marriage market. An ability-x_m man's expected utility gain from the risky career over the safe career, *with the marriage market*, is

$$\begin{aligned}
& \mathbb{E}_{\varepsilon_m} \left[u_m(v_m(x_m - c + \varepsilon_m)) - u_m(v_m(x_m)) \right] \\
= \; & \mathbb{E}_{\varepsilon_m} \left[s(x_m - c + \varepsilon_m, z_w(x_m - c + \varepsilon_m)) - v_w(z_w(x_m - c + \varepsilon_m)) - u_m(v_m(x_m)) \right].
\end{aligned}$$

□

A.6 Proof of Theorem 2

Define

$$\delta_m(p_m, p_w) \equiv t_m - c(p_m, p_w) + (1-\rho_m) \left(\alpha_m + \alpha_w \sqrt{\frac{\sigma_{x_w}^2 + p_w s_w^2}{\sigma_{x_m}^2 + p_m s_m^2}} \right) \frac{s_m^2}{2},$$

and

$$\delta_w(p_m, p_w) \equiv t_w - c(p_m, p_w) - k + (1-\rho_w) \left(\alpha_w + \alpha_m \sqrt{\frac{\sigma_{x_m}^2 + p_m s_m^2}{\sigma_{x_w}^2 + p_w s_w^2}} \right) \frac{s_w^2}{2}.$$

Economically, $\delta_m(p_m, p_w)$ and $\delta_w(p_m, p_w)$ have the same sign as Δ_m and Δ_w where the proportion p_m of men and proportion p_w of women choose the risky career. Define correspondences

$$\rho_m(p_m, p_w) \equiv \begin{cases} 0 & \text{if } \delta_m(p_m, p_w) < 0 \\ [0,1] & \text{if } \delta_m(p_m, p_w) = 0 \\ 1 & \text{if } \delta_m(p_m, p_w) > 0 \end{cases},$$

and

$$\rho_w(p_m, p_w) \equiv \begin{cases} 0 & \text{if } \delta_w(p_m, p_w) < 0 \\ [0,1] & \text{if } \delta_w(p_m, p_w) = 0 \\ 1 & \text{if } \delta_w(p_m, p_w) > 0 \end{cases}.$$

Economically, $\rho_m(p_m, p_w)$ and $\rho_w(p_m, p_w)$ represent the optimal probabilities of men and women who would choose the risky career if proportion ρ_m of men and proportion ρ_w of women choose the risky career. An equilibrium exists if the mapping

$$\rho(p_m, p_w) = (\rho_m(p_m, p_w), \rho_w(p_m, p_w))$$

has a fixed point. Since $\rho : [0,1]^2 \to [0,1]^2$ is upper hemicontinuous, convex-valued, and nonempty, by Kakutani's fixed-point theorem, a fixed point exists.

Furthermore, equilibrium exists uniquely if $1 - \rho_m > 0$ and $1 - \rho_m > 0$. Note that because $1 - \rho_m > 0$, $\delta_m(p_m, p_w)$ decreases in p_m. Fix p_w. Define $p_m(p_w)$ as follows:

$$p_m(p_w) = \begin{cases} 1 & \text{if } \delta_m(0, p_w) > \delta_m(1, p_w) > 0 \\ \text{solution of } \delta_m(p_m, p_w) = 0 & \text{if } \delta_m(0, p_w) > 0 > \delta_m(1, p_w) \\ 0 & \text{if } 0 > \delta_m(0, p_w) > \delta_m(1, p_w) \end{cases}.$$

The function $p_m(p_w)$ is continuous and differentiable. We will show that $\delta_w(p_m(p_w), p_w)$ strictly decreases in p_w.

$$\delta_w(p_m(p_w), p_w) = t_w - c(p_m(p_w), p_w) - k + \frac{s_w^2}{2}(1 - \rho_w)\left(\alpha_w + \alpha_m\sqrt{\frac{\sigma_{x_m}^2 + p_m(p_w)s_m^2}{\sigma_{x_w}^2 + p_w s_w^2}}\right).$$

First note that

$$\frac{d\sqrt{\frac{\sigma_{x_m}^2 + p_m(p_w)s_m^2}{\sigma_{x_w}^2 + p_w s_w^2}}}{dp_w} = \sqrt{\frac{\sigma_{x_m}^2 + p_m(p_w)s_m^2}{\sigma_{x_w}^2 + p_w s_w^2}}\left(\frac{s_m^2/2}{\sigma_{x_m}^2 + p_m(p_w)s_m^2}p_m{}'(p_w) - \frac{s_w^2/2}{\sigma_{x_w}^2 + p_w s_w^2}\right)$$

$$\equiv r_m(A_m p_m'(p_w) - A_w).$$

Denote $\frac{s_w^2}{2}(1-\rho_w)$ by B_w. Hence,

$$\delta_w(p_m(p_w), p_w) = t_w - c(p_m(p_w), p_w) - k + B_w(\alpha_w + \alpha_m r_m),$$

and

$$\begin{aligned}\frac{d\delta_w(p_m(p_w), p_w)}{dp_w} =& - c'(p)(p_m'(p_w) + 1) + B_w \alpha_m r_m (A_m p_m'(p_w) - A_w)\\ =&(B_w \alpha_m r_m A_m - c'(p))p_m'(p_w) - (A_w B_w \alpha_m r_m + c'(p)).\end{aligned}$$

If $p_m'(p_w) = 0$, then we are done. If $p_m'(p_w) \neq 0$, then by the implicit function theorem,

$$\delta_m(p_m(p_w), p_w) = t_m - c(p_m(p_w), p_w) + B_m(\alpha_m \alpha_w r_w) = 0,$$

where $B_w = (1-\rho_m)\frac{s_m^2}{2}$ and $r_w = 1/r_m$. Since

$$\frac{dr_w}{dp_w} = r_w(A_w - A_m p_m'(p_w)),$$

We have

$$0 = \frac{d\delta_m(p_m(p_w), p_w)}{dp_w} = -c'(p)(p_m'(p_w) + 1) + B_m \alpha_w r_w (A_w - A_m p_m'(p_w)).$$

Rearrange to get

$$p_m'(p_w) = \frac{A_w B_m \alpha_w r_w - c'(p)}{A_m B_m \alpha_w r_w + c'(p)}.$$

Plugging into $\frac{d\delta_w}{dp_w}$, we get

$$\begin{aligned}&\frac{d\delta_w(p_m(p_w), p_w)}{dp_w}\\ =&(A_m B_w \alpha_m r_m - c'(p))\frac{A_w B_m \alpha_w r_w - c'(p)}{A_m B_m \alpha_w r_w + c'(p)} - (A_w B_w \alpha_m r_m + c'(p))\\ =&\frac{(A_m B_w \alpha_m r_m - c'(p))(A_w B_m \alpha_w r_w - c'(p)) - (A_m B_m \alpha_w r_w + c'(p))(A_w B_w \alpha_m r_m + c'(p))}{A_m B_m \alpha_w r_w + c'(p)}\\ =&- \frac{(A_m B_w \alpha_m r_m + A_w B_m \alpha_w r_w + A_m B_m \alpha_w r_w + A_w B_w \alpha_m r_m)c'(p)}{A_m B_m \alpha_w r_w + c'(p)} < 0.\end{aligned}$$

Since $d\delta_w/dp_w < 0$, define p_w^* as follows:

$$p_w^* = \begin{cases} 1 & \text{if } \delta_w(p_m(0), 0) > \delta_w(p_m(1), 1) > 0 \\ \text{solution of } \delta_w(p_m(p_w), p_w) = 0 & \text{if } \delta_w(p_m(0), 0) > 0 > \delta_w(p_m(1), 1) \\ 0 & \text{if } 0 > \delta_w(p_m(0), 0) > \delta_w(p_m(1), 1) \end{cases}.$$

Then $(p_m(p_w^*), p_w^*)$ characterizes the unique equilibrium.

A.7 Proof of Proposition 1

A man would strictly prefer the risky career if

$$\delta_m = t_m - c + (1 - \rho_m)(\alpha_m + \alpha_w \frac{\sigma_{y_w}}{\sigma_{y_m}}) \frac{s_m^2}{2} > 0.$$

If $t_m - c = -\frac{s_m^2}{2}$ (the safe career and the risky career have the same expected income), $\rho_m = 0$, and $\alpha_m = 1$ (the marriage surplus is linear in income), then $\delta_m = \alpha_w \frac{\sigma_{y_w}}{\sigma_{y_m}} \frac{s_m^2}{2} > 0$. If $t_m - c = -\frac{s_m^2}{2} - e_m$, then $\delta_m = -e_m + ((1 - \rho_m)(\alpha_m + \alpha_w \frac{\sigma_{y_w}}{\sigma_{y_m}}) - 1)\frac{s_m^2}{2}$. As long as $e_m < ((1 - \rho_m)(\alpha_m + \alpha_w \frac{\sigma_{y_w}}{\sigma_{y_m}}) - 1)\frac{s_m^2}{2}$, a risk-averse man would strictly prefer the risky career that yields a lower expected income. Similarly, if $t_w - c = -\frac{s_w^2}{2} - e_w$, then $\delta_w = -k - e_w + ((1 - \rho_w)(\alpha_w + \alpha_m \frac{\sigma_{y_m}}{\sigma_{y_w}}))\frac{s_w^2}{2}$. As long as $e_w < ((1 - \rho_w)(\alpha_w + \alpha_m \frac{\sigma_{y_m}}{\sigma_{y_w}}))\frac{s_w^2}{2}$, a risk-averse woman would strictly prefer the risky career with a lower expected income.

A.8 Proof of Proposition 2

A greater income variance for men than for women, $\sigma_{y_m}^{*2} = \sigma_x^2 + p_m^* s^2 > \sigma_x^2 + p_w^* s^2 = \sigma_{y_w}^{*2}$, implies

$$p_m^* = \frac{\sigma_{y_m}^2 - \sigma_x^2}{s^2} > \frac{\sigma_{y_w}^2 - \sigma_x^2}{s^2} = p_w^*.$$

A.9 Proof of Proposition 3

The two parts are proved as follows.

1. Since $0 < p_m^* < 1$ and $0 < p_w^* < 1$, the two equilibrium premiums are

$$\delta_m{}^* = t - c^* + (1 - R)\left(\alpha_m + \alpha_w \frac{1}{r^*}\right)\frac{s^2}{2} = 0$$

and

$$\delta_w{}^* = t - c^* - k + (1-R)(\alpha_w + \alpha_m r^*)\frac{s^2}{2}$$
$$= t - c^* - k + r^*(1-R)\left(\alpha_m + \alpha_w \frac{1}{r^*}\right)\frac{s^2}{2} = 0,$$

where $r^* = \sigma^*_{y_m}/\sigma^*_{y_w}$. Subtract the two equations to get

$$(r^* - 1)(1-R)\left(\alpha_m + \alpha_w \frac{1}{r^*}\right)\frac{s^2}{2} = k.$$

Since $1-R$ is assumed to be positive, in order for the left-hand side of the equation to be positive, $r^* > 1$, so $\sigma^*_{y_m} > \sigma^*_{y_w}$.

2. Rearranging the equilibrium condition

$$(r-1)(1-R)(\alpha_m + \alpha_w \frac{1}{r})\frac{s^2}{2} = k,$$

We get

$$(r-1)(\alpha_m r + \alpha_w) = \frac{2k}{(1-R)s^2},$$

$$\alpha_m r^2 - \alpha_m r + \alpha_w r - \alpha_w = \frac{2k}{(1-R)s^2} r,$$

and

$$r^2 - \left(1 - \frac{\alpha_w}{\alpha_m} + \frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right) - \frac{\alpha_w}{\alpha_m} = 0.$$

Therefore,

$$r^* = \frac{1}{2}\left[\left(1 - \frac{\alpha_w}{\alpha_m} + \frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right) + \sqrt{\left(1 - \frac{\alpha_w}{\alpha_m} + \frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right)^2 + 4\frac{\alpha_w}{\alpha_m}}\right].$$

Obviously, r^* increases in k, decreases in $(1-R)$, and decreases in s^2. It is less obvious to derive $\partial r^*/\partial \alpha_w$:

$$\frac{\partial r^*}{\partial \alpha_w} = \frac{1}{2}\left[-\frac{1}{\alpha_m} + \frac{1}{2}\frac{\left(1 - \frac{\alpha_w}{\alpha_m} + \frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right) + \frac{4}{\alpha_m}}{\sqrt{\left(1 - \frac{\alpha_w}{\alpha_m} + \frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right)^2 + 4\frac{\alpha_w}{\alpha_m}}}\right]$$

$$=\frac{1}{2}\frac{1}{\alpha_m}\frac{2-r^*}{\sqrt{\left(1-\frac{\alpha_w}{\alpha_m}+\frac{1}{\alpha_m}\frac{2k}{(1-R)s^2}\right)^2+4\frac{\alpha_w}{\alpha_m}}}.$$

$\frac{\partial r^*}{\partial \alpha_w} > 0$ if $r^* < 2$, and $\frac{\partial r^*}{\partial \alpha_w} < 0$ if $r^* > 2$.

A.10 Proof of Lemma 5

Marriage timing is related to the career choice as follows.

1. A man who chooses the safe career gets a marriage payoff of $v_m(x_m)$ regardless of his marriage timing decision, so he is indifferent between marrying in the first period and marrying in the second period.

2. A woman who chooses the safe career gets a marriage payoff of $v_w(x_w)$ if she marries in the first period and gets $v_w(x_w - k) < v_w(x_w)$ if she marries in the second period, so she chooses to marry in the first period if she chooses the safe career.

3. An ability-x_m man who chooses the risky career gets a marriage payoff of

$$s(x_m - c + \varepsilon_m, \widetilde{z}_w) - v_w(\widetilde{z}_w)$$

if $\widetilde{z}_w$ is his wife's marriage type, and he realizes income $x_m - c + \varepsilon_m$. However, if he waits until the second period to get married, then he gets

$$v_m(x_m - c + \varepsilon_m) = s(x_m - c + \varepsilon_m, z_w(x_m - c + \varepsilon_m)) - v_w(z_w(x_m - c + \varepsilon_m)).$$

By the stability condition, for any $\widetilde{z}_w$,

$$v_m(x_m - c + \varepsilon_m) \geq s(x_m - c + \varepsilon_m, \widetilde{z}_w) - v_w(\widetilde{z}_w).$$

Therefore, for any realization of ε_m, the man is weakly better off to wait until the second period to marry. Since for different ε_m, the man marries a different partner in the second period, he is almost always strictly better off to wait until the second period to marry. The expected marriage payoff is strictly higher when a man who chooses the risky career marries in the second period.

4. An ability-x_w woman who chooses the risky career gets a marriage payoff of

$$s(\widetilde{z}_m, x_w - c - k + \varepsilon_w) - v_m(\widetilde{z}_m),$$

if $\widetilde{z}_m$ is her husband's marriage type and she realizes income $x_w - c + \varepsilon_w$. However, if she waits until the second period to get married when she realizes income $x_w - c + \varepsilon_w$, then she gets

$$v_w(x_w - c + \varepsilon_w) = s(z_m(x_w - c + \varepsilon_w), x_w - c + \varepsilon_w) - v_m(z_m(x_w - c + \varepsilon_w)).$$

By the stability condition, for any $\widetilde{z}_w$,

$$v_w(x_w - c + \varepsilon_w) \geq s(\widetilde{z}_m, x_w - c + \varepsilon_w) - v_m(\widetilde{z}_m).$$

Therefore, for any realization of ε_w, the woman is weakly better off to wait until the second period to marry. Since for different ε_w the woman marries a different husband in the second period, it is almost always strictly better off to wait until the second period to marry. Hence, the expected marriage payoff is strictly higher when a woman who chooses the risky career marries in the second period.

A.10.1 Gender Differences in Postmarital Career Choices

Finally, we can compare the payoffs from not resolving and resolving the risky career's income uncertainty. If a man marries in the first period after choosing the risky career, the expected surplus he gets from marrying an income-y_w woman is $\mathbb{E}[s(x_m + \varepsilon_m, y_w)|x_m]$. Hence, a man who chooses the risky career and marries early is treated as if he chooses the safe career and marries early. As a result, a male risk-taker is better off waiting to marry in the second period. This result again highlights the fact that the marital benefits from the risky career come from the possibility of switching partners. Remember that the wife a man marries is the wife that maximizes his personal marriage payoff, so choosing the risky career while unmarried is better than choosing the risky career while married. In contrast, an unmarried woman faces the additional reproductive cost, so she is more inclined to choose a safe career while unmarried. However, after she is married and has had children, she no longer worries about the reproductive decline. If she can choose a different career, she may opt to choose a riskier career. This gender-differential effect yields the second part of the proposition below.

Proposition 5. *A married person is less likely than an unmarried person to choose a risky career, and a married woman is more likely to switch to a risky career than a married man.*

Of course, there are many other considerations with regard to switching one's career. The accumulation of specific human capital makes it costly to switch to another career. Once a person is married and has children, household production demands an increasing amount of time, and the burden mostly falls on the wife. From the 2016 American Community Survey, the share of men in risky careers gradually increase with age, from around 57% between ages 25 and 34 to about 65% between 45 and 54.In contrast, the share of women in risky careers is rather stable across different age groups, at around 50%. Using a balanced panel from the National Longitudinal Survey of Young 1979 and exploiting within-person variation, we find that being married is associated with a 1.2 p.p. reduction in the probability of being in the risky occupation for men, and a 4.2 p.p. reduction for women.This is consistent with voluminous studies that show wives are more likely to sacrifice career for family (e.g., Goldin, 1990, 2015; Bertrand et al., 2010).

Proof of Proposition 5. The effects of marital status on the risky career choice differ by gender in the following ways. If a type-z_m man who is married to a type $\widetilde{z}_w$ woman chooses the risky career and realizes an income $z_m - c + \varepsilon_m$, he gets a marriage payoff of $s(z_m - c + \varepsilon_m, \widetilde{z}_w) - v_w(\widetilde{z}_w)$. In contrast, if the same type z_m man who is unmarried chooses the risky career and realizes an income $z_m - c + \varepsilon_m$, he gets a marriage payoff of $s(z_m - c + \varepsilon_m, z_w(z_m - c + \varepsilon_m)) - v_w(z_w(z_m - c + \varepsilon_m)) \geq s(z_m - c + \varepsilon_m, \widetilde{z}_w) - v_w(\widetilde{z}_w)$, and the inequality holds strictly as long as $-c + \varepsilon_m \neq 0$.

If a type-z_w woman who is married to a type $\widetilde{z}_m$ man chooses the risky career and realizes an income $z_w - c + \varepsilon_w$, she gets a marriage payoff of

$$s(\widetilde{z}_m, z_w - c + \varepsilon_w) - v_m(\widetilde{z}_m).$$

In contrast, if the same type z_w woman who is unmarried chooses the risky career and realizes an income $z_w - c + \varepsilon_w$, she gets marriage payoff of

$$s(z_m(z_w - c + \varepsilon_w - k), z_w - c + \varepsilon_w - k) - v_m(z_m(z_w - c + \varepsilon_w - k)).$$

The difference between the marriage payoffs can be written as

$$\begin{aligned}
&[s(z_m(z_w - c + \varepsilon_w - k), z_w - c + \varepsilon_w - k) - v_m(z_m(z_w - c + \varepsilon_w - k))] \\
&- [s(\widetilde{z}_m, z_w - c + \varepsilon_w - k) - v_m(\widetilde{z}_m)] \\
&+ [s(\widetilde{z}_m, z_w - c + \varepsilon_w - k) - v_m(\widetilde{z}_m)] - [s(\widetilde{z}_m, z_w - c + \varepsilon_w) - v_m(\widetilde{z}_m)].
\end{aligned}$$

The first two terms together are positive, but the third term is negative. The first two terms show that by deciding whom to marry after the income is realized, an unmarried woman has a higher incentive to choose the risky career. The last term shows that the absence of a reproductive decline gives a married woman a higher incentive to choose the risky career. □