# A Marriage-Market Perspective of Career Choices

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**Abstract**

This paper incorporates career choices in an equilibrium marriage-market model to justify risky career choice due to marriage-market incentives, as well as to explain gender differences in career choices, income inequality, marriage timing, and effects of marital status on career choices. Namely, (1) the marriage-market benefits from successful career outcomes encourage both men and women to choose risky careers, (2) men are more likely than women to choose risky careers because of gender differences in reproductive length, (3) income inequality among men is bigger than income inequality among women, (4) men choose risky careers and marry late whereas women tend to choose safe careers and marry early, (5) unmarried men are more likely than married men to choose risky careers, whereas unmarried women are less likely than married women to choose risky careers.

**Keywords**: career choices, marriage market, gender differences in risk-taking

**JEL**: C78, D31, J41

**Preliminary and incomplete. Please do not circulate.**

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# Contents

# 1 Introduction

The choices of a career and a marriage partner are two of the most important lifelong decisions. Many papers have studied these two decisions separately, but few have studied these two decisions jointly, especially in an equilibrium market setting. The main contribution of the paper is *to study risk-taking and career choices in an equilibrium matching framework.* The model we present is simple to state and analyze, and explains many observed patterns that have not been able to be explained jointly in a unified framework or to be explained at all. The model makes the following six predictions, stated as six propositions in the paper:

1. (Risky career choice due to marriage-market incentives). Because of the possibility to improve bargaining power and partner quality in the marriage market after successful career outcome, both men and women may choose a *risky career*, an career with an uncertain income path, than a *safe career*, an career with a certain income path, even if the risky career yields a lower expected income.

2. (Gender difference in career choices). Men are more likely than women to choose risky careers, because it takes time to realize the outcome from a risky career, and it is more costly for women to wait for the outcome due to their shorter reproductive lengths.

3. (Gender difference in income inequality). Because men are more likely than women to choose risky careers, the income inequality among men is larger than the income inequality among women.

4. (Gender difference in marriage timing). Men tend to choose risky careers and marry late, whereas women tend to choose safe careers and marry early.

5. (Gender difference in effects of marital status on career choices). Because of the possibility to improve martial prospects, unmarried men are more likely to choose risky careers than married men. In contrast, because of the constraint in reproductive length that interferes with their career choice, unmarried women are more likely to choose safe careers than married women.

The paper makes three main contributions.

First and foremost, the paper incorporates career choices into an equilibrium marriage-market framework. Previously, many papers have studied how different biologically rooted preferences might affect individuals' career choices. Most of the papers are empirical or experimental because the theoretical channels are quite straightforward. However, there are subtleties regarding the effects of the competitive marriage market on career choices. With the endogenous and simultaneous determination of career choices, marriage timing, income distributions, marriage matching, and division of marriage surplus, we can derive a set of results that have not been explained before.

Second, Proposition 1 provides a new explanation of risk-taking based on the marriage market. All of these papers have talked about why people may take risks: Smith (1776), Friedman and Savage (1948, JPE), Friedman (1953, JPE), Rubin and Paul (1979, EI), Robson (1992, Ecta), Robson (1996, GEB), Rosen (1997, JoLE), Becker et al. (2005, JPE).

Third, Propositions 2 to 5 provide a unifying explanation of gender differences in career choices, income inequalities, marriage timing, and effects of marital status on career choices, only assuming gender difference in cost in risky career choice and *without* assuming other inherent gender differences in risk preference, competitiveness, or overconfidence. Previously, people have looked at gender differences in competitiveness (Niederle and Vesterlund, 2007; Kleinjans, 2008; Gill and Prowse, 2014; Wozniak et al., 2014). Siow (1998, JPE) also shows how differential fecundity, the marriage market, and the labor market interact to yield the observed labor and marriage patterns.

Section 2 describes the basic model. Section 3 solves the model and characterizes the equilibrium. Section 4 states testable implications of the model. Section 5 provides examples to illustrate the equilibrium of the model and shows how marriage-market conditions affect career choices. Section 6 concludes.

# 2 Model

Time is discrete and infinite. At the beginning of each period, mass one of men and mass one of women are born. They are distinguished by their human capital levels $x_m$ and $x_w$ distributed according to continuous and strictly increasing mass distributions $F_m$ and $F_w$ with supports $X_m \equiv [\underline{x}_m, \bar{x}_m]$ and $X_w \equiv [\underline{x}_w, \bar{x}_m]$. Let $F_m(\bar{x}_m) = F_w(\bar{x}_w) = 1$ so that there is gender balance.[1]

## 2.1 Career Choices

Each agent can choose a career (around college graduation). They can either choose a *safe career* or a *risky career*. The safe career exactly compensates a person's human capital: an ability $x_m$ person who chooses a safe career receives an income $y_m = x_m$ and an ability $x_w$ person who chooses a safe career receives an income $y_w = x_w$. The risky career noisily compensates a person's human capital: an ability $x_m$ person who chooses a risky career receives an income $y_m = x_m + \varepsilon_m$ where $\varepsilon_m$ is distributed according to a cumulative distribution $\Phi_m(\cdot|x_m)$ and $[\varepsilon_m|x_m] = 0$, and an ability

[1]The gender balance assumption is innocuous, as we can always turn a market with gender imbalance to a market with gender balance by adding dummy agents who would produce zero marriage surplus.

$x_w$ person who chooses a risky career receives an income $y_w = x_w + \varepsilon_w$ where $\varepsilon_w$ is distributed according to a cumulative distribution $\Phi_m(\cdot|x_w)$ and $[\varepsilon_w|x_w] = 0$. In essence, the income distribution realized after choosing the risky career is a mean-preserving spread of that of choosing the safe career.

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 next period to enter the marriage market; we will allow separate career choice and marriage timing in the extended model, but we will see that it is impossible for a person who chooses the safe career to prefer delaying marriage and it is rare for a person who chooses a risky career to prefer an early marriage. The only gender difference between men and women in the model is that women who choose the risky career and enter the marriage market late incur a cost $c$. We interpret this cost as the cost associated with delayed family and childbearing, but we can equally interpret the cost as distaste for a risky career. (We can model the reproductive fitness as an additional dimension of women's characteristics, but incorporating an additional dimension into the model does not bring fundamental insights about the career choices with marital concerns.)

Assume that each agent of the same gender-ability type chooses the same strategy, so that the strategies are stationary and ability-symmetric. $\sigma_m(x_m)$ represents the probability that an ability $x_m$ man invests in a risky career, and $\sigma_w(x_w)$ represents the probability that an ability $x_w$ woman invests in a risky career.

## 2.2 Income Distributions

Career choices $\sigma_m$ and $\sigma_w$ *induce* income distributions $G_m$ and $G_w$. For any $y_m$,

$$G_m(y_m) = \int_{\underline{x}_m}^{\overline{x}_m} [1_{x_m \leq y_m}(1 - \sigma_m(x_m)) + \Phi_m(y_m - x_m|x_m)\sigma_m(x_m)]\, dF_m(x_m),$$

and for any $y_w$,

$$G_w(y_w) = \int_{\underline{x}_w}^{\overline{x}_w} [1_{x_w \leq y_w}(1 - \sigma_w(x_w)) + \Phi_w(y_w - x_w|x_w)\sigma_w(x_w)]\, dF_w(x_w).$$

## 2.3 The Marriage Market

The marriage surplus an income $y_m$ man and an income $y_w$ woman produce is $s(y_m, y_w) = y_m y_w$ (see the appendix for a household production problem that justifies the use of this specific surplus function, and the production problem also justifies transferable utilities), and any single produces zero. Note the few properties of the surplus function we will use repeatedly:

1. The surplus function is twice differentiable.

2. The surplus function increases linearly in the man's income: $\partial s/\partial y_m = y_w > 0$.

3. The surplus function increases linearly in woman's income: $\partial s/\partial y_w = y_m > 0$.

4. The surplus function is strictly supermodular in the incomes: $\partial^2 s/\partial y_m \partial y_w = 1 > 0$.

5. The surplus function is symmetric in incomes: $s(y, y') = s(y', y)$.

Men and women match and negotiate the division of their marriage surplus to reach a stable outcome of the marriage market.

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

*1. A stable matching measure* $G(Y_m \times Y_w)$ *describes the measure of* $(y_m, y_w) \in Y_m \times Y_w$ *couples and has marginals* $G_m$ *and* $G_w$*.*

*2. Stable marriage payoff functions* $v_m(y_m)$ *and* $v_w(y_w)$ *describe income* $y_m$ *men and income* $y_w$ *women's marriage payoffs and satisfy the following conditions:*

   *(a) Everyone is better than being single:* $v_m(y_m) \geq 0$ *and* $v_w(y_w) \geq 0$ *for any* $y_m$ *and* $y_w$*.*

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

   *(c) No other division of surplus would make any unmatched pair of man and woman strictly better off:* $v_m(y_m) + v_w(y_w) \geq s(y_m, y_w)$ *for any* $(y_m, y_w)$*.*

By Gretsky et al. (1992), a stable marriage market outcome always exists. Because surplus is strictly supermodular in incomes, by Becker (1973), men and women are positive-assortatively matched in incomes in any stable matching. For continuous and strictly increasing cumulative distributions $G_m$ and $G_w$, under any stable matching, $G_w(y_w) = G_m(y_m)$. Let $y_w(y_m)$ represent $y_m$ man's wife's income and $y_m(y_w)$ an income $y_w$ woman's husband's income: $y_w(y_m) \equiv G_w^{-1}(G_m(y_m))$ and $y_m(y_w) \equiv G_m^{-1}(G_w(y_w))$. The conditions the stable marriage payoffs satisfy can be rewritten as follows: for any $y_m$,

$$v_m(y_m) + v_w(y_w(y_m)) = s(y_m, y_w(y_m)),$$

and for $y_w$,

$$v_m(y_m(y_w)) + v_w(y_w) = s(y_m(y_w), y_m).$$

We will further characterize the equilibrium marriage payoff functions in the next section.

## 2.4 Payoffs

Each person is risk neutral and does not discount. A person's payoff consists of his/her income and marriage payoff: an income $y_m$ man's utility is $y_m + v_m(y_m)$, and an income $y_w$ woman's utility is $y_w + v_w(y_w)$ potentially net a cost $c$ associated with a risky investment. An $x_m$ man's expected payoff from strategy $\sigma_m(x_m)$ is

$$\begin{aligned} u_m(\sigma_m|x_m) &= \sigma_m(x_m)\mathbb{E}\left[x_m + \varepsilon_m + v_m(x_m + \varepsilon_m)|x_m\right] + (1 - \sigma_m(x_m))\left[x_m + v_m(x_m)\right] \\ &= x_m + \sigma_m(x_m)\mathbb{E}\left[v_m(x_m + \varepsilon_m)|x_m\right] + (1 - \sigma_m(x_m))v_m(x_m) \end{aligned}$$

where the second line follows from the fact that the expected income of the risky career is the same as that of the safe career. An $x_w$ woman's expected payoff from strategy $\sigma_w(x_w)$ is

$$\begin{aligned} u_w(\sigma_w|x_w) &= \sigma_w(x_w)\left[\mathbb{E}\left[x_w + \varepsilon_w + v_w(x_w + \varepsilon_w)|x_w\right] - c\right] + (1 - \sigma_w(x_w))\left[x_w + v_w(x_w)\right] \\ &= x_w + \sigma_w(x_w)\left[\mathbb{E}\left[v_w(x_w + \varepsilon_w)|x_w\right] - c\right] + (1 - \sigma_w(x_w))v_w(x_w). \end{aligned}$$

## 2.5 Summary

In summary, the model's primitives are: continuous and strictly increasing ability distributions $F_m(\cdot)$ and $F_w(\cdot)$, risky career's continuous and strictly increasing income distributions $\Phi_m(\cdot|x_m)$ and $\Phi_w(\cdot|x_w)$ for all $x_m \in$ support$(F_m)$ and $x_w \in$ support$(F_w)$, women's investment cost $c > 0$, and the marriage surplus function $s(y_m, y_w) = y_m y_w$. Hence, $(F_m, F_w, \Phi_m, \Phi_w, c, s)$ summarizes the model.

# 3 Equilibrium

In this section, we characterize the stationary equilibrium of the model.

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

1. $\sigma_m^*(x_m)$ *maximizes an* $x_m$ *man's expected utility when men's marriage payoff is* $v_m^*$*:*

$$\sigma_m^*(x_m) \in \arg\max_{\sigma_m \in [0,1]} \sigma_m \mathbb{E}\left[v_m^*(x_m + \varepsilon_m)|x_m\right] + (1 - \sigma_m)v_m^*(x_m)\ \forall x_m \in \textit{support}(F_m),$$

*and* $\sigma_w^*(x_w)$ *maximizes an* $x_w$ *woman's expected utility when women's marriage payoff is* $v_w^*$*:*

$$\sigma_w^*(x_w) \in \arg\max_{\sigma_w \in [0,1]} \sigma_w \mathbb{E}\left[v_w^*(x_w + \varepsilon_m)|x_w\right] + (1 - \sigma_w)v_w^*(x_w)\ \forall x_w \in \textit{support}(F_w).$$

2. *Men's career choices $\sigma_m^*$ induce men's income distribution $G_m^*$:*

$$G_m^*(y_m) = \int_{\underline{x}_m}^{\overline{x}_m} [1_{x_m \le y_m}(1-\sigma_m^*(x_m)) + \Phi_m(y_m - x_m|x_m)\sigma_m^*(x_m)]\, dF_m(x_m)\ \forall y_m,$$

*and women's career choices $\sigma_w^*$ induce women's income distribution $G_w^*$:*

$$G_w^*(y_w) = \int_{\underline{x}_w}^{\overline{x}_w} [1_{x_w \le y_w}(1-\sigma_w^*(x_w)) + \Phi_w(y_w - x_w|x_w)\sigma_w^*(x_w)]\, dF_w(x_w)\ \forall y_w.$$

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

## 3.1 Marriage Payoffs

Stable marriage payoff functions are derived as follows. By the stability conditions that for any $y_m$: $v_m(y_m) + v_w(y_w(y_m)) = s(y_m, y_w(y_m))$ and $v_m(y_m) + v_w(y_w) \ge s(y_m, y_w)$ for any $y_w \ne y_w(y_m)$, we have

$$v_m(y_m) = s(y_m, y_w(y_m)) - v_m(x_m) \ge s(y_m, y_w) - v_w(y_w) \forall y_w \ne y_w(y_m).$$

Thus,

$$v_m(y_m) = \max_{y_w \in \text{support}(G_w)} \left[ s(y_m, y_w(y_m)) - v_w(y_w) \right].$$

Hence we have the envelope condition

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

Taking the derivative with respect to $y_m$,

$$v_m'(y_m) = \frac{\partial s(y_m, y_w(y_m))}{\partial y_m} + \underbrace{\frac{\partial s(y_m, y_w(y_m))}{\partial y_w} y_w'(y_m) - v_w'(y_w)}_{=0 \text{ by the envelope condition}} = \frac{\partial s(y_m, y_w(y_m))}{\partial y_m}.$$

By the fundamental theorem of calculus, for any $\widetilde{y}_m$,

$$v_m(\widetilde{y}_m) = v_m(\underline{y}_m) + \int_{\underline{y}_m}^{\widetilde{y}_m} \frac{\partial s(y_m, y_w(y_m))}{\partial y_m} dy_m = v_m(\underline{y}_m) + \int_{\underline{y}_m}^{\widetilde{y}_m} y_w(y_m) dy_m.$$

Similarly, for any $\widetilde{y}_w$,

$$v_w(\widetilde{y}_w) = v_w(\underline{y}_w) + \int_{\underline{y}_w}^{\widetilde{y}_w} \frac{\partial s(y_m(y_w), y_w)}{\partial y_w} dy_w = v_w(\underline{y}_w) + \int_{\underline{y}_w}^{\widetilde{y}_w} y_m(y_w) dy_w.$$

The stable marriage payoff functions are continuously differentiable and strictly increasing because the surplus function is continuously differentiable and strictly increasing. Most importantly,

**Lemma 1.** *Men's and women's marriage payoff functions are convex in their respective income.*

**Proof of Lemma 1.** For $v_m(\widetilde{y}_m) = v_m(\underline{y}_m) + \int_{\underline{y}_m}^{\widetilde{y}_m} y_w(y_m) dy_m$,

$$v_m'(\widetilde{y}_m) = y_w(\widetilde{y}_m)$$

$$v_m''(\widetilde{y}_m) = y_w'(\widetilde{y}_m) > 0$$

since there is positive assortative matching in equilibrium. Similarly, for $v_w(\widetilde{y}_w) = v_w(\underline{y}_w) + \int_{\underline{y}_w}^{\widetilde{y}_w} y_m(y_w) dy_w$,

$$v_w'(\widetilde{y}_w) = y_m(\widetilde{y}_w),$$

$$v_w''(\widetilde{y}_w) = y_m'(\widetilde{y}_w) > 0$$

since there is positive assortative matching in equilibrium. □

## 3.2 Career Choices

The first main result of the paper is that men always choose risky careers, due to the incentives provided by the marriage market.

**Lemma 2.** *It is a strictly dominant strategy for each man to choose the risky career.*

**Proof of Lemma 2.** An $x_m$ man's expected utility from choosing the safe career is $x_m + v_m(x_m)$ and his expected utility from the risky career is $x_m + \mathbb{E}[v_m(x_m + \varepsilon_m)|x_m]$. The utility gain from a risky career over a safe career is $\mathbb{E}[v_m(x_m + \varepsilon_m)|x_m] - v_m(x_m)$. For each realization of $\varepsilon_m$,

$$v_m(x_m + \varepsilon_m) = s\big(x_m + \varepsilon_m, y_w(x_m + \varepsilon_m)\big) - v_w(y_w(x_m + \varepsilon_m)).$$

By the stability condition, for any $y_w$,

$$v_m(x_m + \varepsilon_m) \geq s(x_m + \varepsilon_m, y_w) - v_w(y_w).$$

In particular,

$$v_m(x_m + \varepsilon) = s(x_m + \varepsilon_m, y_w(x_m + \varepsilon_m)) - v_w(y_w(x_m + \varepsilon)) \geq s(x_m + \varepsilon_m, y_w(x_m)) - v_w(y_w(x_m)).$$

Economically, the inequality states that an income $x_m + \varepsilon_m$ man's marriage payoff when he marries an income $y_w(x_m + \varepsilon_m)$ woman and pays her her competitive marriage payoff $v_w(y_w(x_m + \varepsilon_m))$ is better than the marriage payoff he would get if he marries an income $y_w(x_m)$ woman, his hypothetical wife if he chooses the safe career, and gives her her competitive payoff $v_w(y_w(x_m))$. Since the matching is unique, the inequality holds strictly,

$$v_m(x_m+\varepsilon) > s(x_m+\varepsilon_m, y_w(x_m)) - v_w(y_w(x_m)),$$

and the inequality holds for any $\varepsilon_m$. Taking the expectation over all $\varepsilon_m$,

$$\mathbb{E}[v_m(x_m+\varepsilon_m)|x_m] > \mathbb{E}\left[s(x_m+\varepsilon_m, y_w(x_m)) - v_w(y_w(x_m))|x_m\right].$$

Since $s(y_m, y_w) = y_m y_w$, the inequality becomes

$$\begin{aligned}
\mathbb{E}[v_m(x_m+\varepsilon_m)|x_m] &> \mathbb{E}\left[(x_m+\varepsilon_m)y_w(x_m) - v_w(y_w(x_m))|x_m\right] \\
&= \mathbb{E}\left[(x_m+\varepsilon_m)|x_m\right] y_w(x_m) - v_w(y_w(x_m)) \\
&= x_m y_w(x_m) - v_w(y_w(x_m)) \\
&= s_m(x_m, y_w(x_m)) - v_w(y_w(x_m)) \\
&= v_m(x_m)
\end{aligned}$$

where the first equality follows from the fact that $y_w(x_m)$ is not a random variable, the second equality follows from the fact that $\mathbb{E}[x_m+\varepsilon|x_m] = x_m$ by assumption, the third equality follows from the fact that $s_m(x_m, y_w(x_m)) = x_m y_w(x_m)$, and the fourth and final equality follows from the stability condition that a couple, $x_m$ and $y_w(x_m)$ divide up the marriage surplus, $v_m(x_m) + v_w(y_w(x_m)) = s_m(x_m, y_w(x_m))$. □

Note that the proof of Lemma 2 does not at all rely on the fact that the surplus is strictly supermodular. The surplus could have been strictly submodular, e.g. $s(y_m, y_w) = y_m + y_w - y_m y_w$ and the result would still hold perfectly. The proof partially relies on the linearly of surplus in incomes to guarantee that *all* men strictly prefer the risky career; the linearity of surplus in men's income is sufficient but not necessary. As long as the surplus function is weakly convex in men's income, the result continues to hold. The specific functional form of the surplus function does aide in the proof and the clean statement of the result, but the key ingredients that drives the strict dominance of the risky career are the re-interpreted stability conditions.

In contrast, since women face an additional cost associated with choosing the risky career, when the cost is sufficiently large, not all women choose the risky career and some will opt to choose the safe career; and if the cost is too large, all women choose the safe career.

**Lemma 3.** *There exist $\underline{c}$ and $\overline{c}$ such that (1) if $c \leq \underline{c}$, (there exists an equilibrium in which) each woman chooses the safe career; (2) if $\underline{c} < c < \overline{c}$, (there exists an equilibrium in which) a positive* *mass of women choose the safe career and a positive mass of women choose the risky career; and (3) if $c \geq \underline{c}$, (there exists an equilibrium in which) each woman chooses the risky career.*

**Proof of Lemma 3.** Let $G_m^R$ denote men's induced income distribution when all men choose the risky career, i.e., $G_m^R(y_m) \equiv \int_{\underline{x}_m}^{\overline{x}_m} \Phi_m(y_m - x_m|x_m)dF_m(x_m)$, and similarly, let $G_w^R$ denote women's induced income distribution when all women choose the risky career, i.e., $G_w^R(y_w) \equiv \int_{\underline{x}_w}^{\overline{x}_w} \Phi_w(y_w - x_w|x_w)dF_w(x_w)$. Let $y_m^{RR}(y_w) \equiv {G_m^R}^{-1}\left(G_w^R(y_w)\right)$ denote an income $y_w$ woman's husband's income in the stable matching of the marriage market $(G_m^R, G_w^R)$. Then the stable marriage payoff in $(G_m^R, G_w^R)$ is $v_w^{RR}(\widetilde{y}_w) = \int_{\underline{y}_w}^{\widetilde{y}_w} \frac{\partial s\left(y_w, y_m^{RR}(y_w)\right)}{\partial y_w} dy_w$. Let

$$\underline{c} \equiv \min_{x_w \in [\underline{x}_w, \overline{x}_w]} \left[\mathbb{E}\left[v_w^{RR}(x_w + \varepsilon_w)|x_w\right] - v_w^{RR}(x_w)\right].$$

When $c \leq \underline{c}$, it is strictly better off for each woman to choose the risky career when all other men and women choose the risky career, since even the woman who benefits the least from the risky career has a positive net benefit. Thus, if $c \leq \underline{c}$, the equilibrium in which everyone chooses the risky career is sustainable.

Let $G_w^S = F_w$ denote women's induced income distribution when all women choose the safe career. Let $y_m^{RS}(y_w)$ an income $y_w$ woman's husband's income in the stable matching of the marriage market $(G_m^R, G_w^S)$, i.e. $y_m^{RS}(y_w) \equiv {G_m^R}^{-1}(G_w^S(y_w)) = {G_m^R}^{-1}(F_w(y_w))$. The stable marriage payoff is $v_w^{RS}(\widetilde{y}_w) = \int_{\underline{y}_w}^{\widetilde{y}_w} \frac{\partial s\left(y_w, y_m^{RS}(y_w)\right)}{\partial y_w} dG_w^S(y_w)$. Let

$$\overline{c} \equiv \max_{x_w \in [\underline{x}_w, \overline{x}_w]} \left[\mathbb{E}\left[v_w^{RS}(x_w + \varepsilon_w)|x_w\right] - v_w^{RS}(x_w)\right].$$

When $c \geq \overline{c}$, it is strictly better off for each woman to choose the safe career when all other men choose the risky career and all women choose the safe career, since even the woman who could benefit the most from choosing the risky career receives a negative net benefit. Thus, if $c \geq \overline{c}$, the equilibrium in which all men choose the risky career and all women choose the safe career is sustainable.

Finally, if $\underline{c} < c < \overline{c}$, then neither the equilibrium in which all women choose the risky career nor the equilibrium in which all women choose the safe career is sustainable. In any equilibrium (if an equilibrium exists), there must exist a positive measure of women choosing the risky career and another positive measure of women choosing the safe career. □

### 3.3 Income Distributions

Since all men choose the risky career, men's equilibrium income distribution is simply represented by

$$G_m^*(y_m) = \int_{\underline{x}_m}^{\overline{x}_m} \Phi_m(y_m - x_m | x_m) dF_m(x_m).$$

Note that $G_m^*$ is a mean-preserving spread of $F_m$. Since not all women choose the risky career and we cannot determine who choose which career without more information on the distributions, we cannot characterize women's income distributions more precisely than the characterization of the induced income distribution,

$$G_w^*(y_w) = \int_{\underline{x}_w}^{\overline{x}_w} \left[1_{x_w \leq y_w}(1 - \sigma_w^*(x_w)) + \Phi_w(y_w - x_w | x_w)\sigma_w^*(x_w)\right] dF_w(x_w).$$

Note that, just like $G_m^*$ is a mean-preserving of $F_m$, $G_w^*$ is a mean-preserving spread of $F_w$.

### 3.4 Equilibrium Existence

**Theorem 1.** *An equilibrium exists.*

We apply Glicksberg's fixed-point theorem to prove equilibrium existence. However, there is no systematic way to guarantee the uniqueness of the equilibrium without parametric assumptions.

**Proof of Theorem 1.** Consider the following composite map

$$\Gamma : \mathscr{V} \rightrightarrows \Sigma_m \times \Sigma_w \to \mathscr{G}_m \times \mathscr{G}_w \rightrightarrows \mathscr{V},$$

where $\mathscr{V}$ is the set of stable marriage payoff functions $v_m : X_m \to \mathbb{R}_+$ and $v_w : X_w \to \mathbb{R}_+$, $\Sigma_m \times \Sigma_w$ is the set of career choice strategies $\sigma_m : X_m \to [0,1]$ and $\sigma_w : X_w \to [0,1]$, and $\mathscr{G}_m \times \mathscr{G}_w$ is the set of income distributions. By Glicksberg's fixed-point theorem, an equilibrium exists if $\mathscr{V}$, the set of stable marriage payoff functions, is non-empty, convex, and compact, and $\Gamma$ is non-empty-valued, upper hemicontinuous, convex-valued, and compact-valued. □

**Uniqueness.** Equilibrium uniqueness is much harder to prove. Ideally, we use the contraction mapping theorem (Banach fixed point theorem) and choose an appropriate metric to show that $\Gamma$ is a contraction. In the parametric examples we work out in the subsequent sections, uniqueness can be shown by construction.

# 4 Predictions

## 4.1 Risky Career Choice due to Marriage Market Incentives

**Proposition 1** (Risky Career Choice due to Marriage-Market Incentives)**.** *Unmarried people might choose a career with a lower expected income and higher income uncertainty even if they are risk-averse, because of the potential marriage-market gain.*

**Proof of Proposition 1.** The result is a direct corollary of Lemma 1. Since the marriage payoff function is strictly convex in income, a risk-neutral man strictly prefers a risky career over a safe career that yields the same expected income. As a result, a risk-averse man could strictly prefer a risky career over a safe career that yields higher expected income, as long as the risk aversion is not too high and the expected income difference is not too big. □

## 4.2 Gender Differences in Career Choices and Income Distributions

**Proposition 2** (Gender Difference in Career Choice)**.** *Unmarried women are less likely than unmarried men to choose risky careers.*

**Proof of Proposition 2.** It is a direct corollary of Lemmas 2 and 3. All men choose the risky career, whereas for sufficiently large women, not all women choose the risky career. □

As a consequence of people choosing their careers to maximize expected utilities, inequality in realized incomes after career choices is larger than inequality in people's ex-ante naturally born abilities, for both genders.

**Remark 1.** *Inequality in incomes after career choices is larger than inequality in abilities before career choices, for both men and women: $G_m^*$ is a mean-preserving spread of $F_m$ and $G_w^*$ is a mean-preserving spread of $F_w$.*

Furthermore, because more men than women choose the risky career, the income inequality among men is larger than that among women.

**Proposition 3** (Gender Difference in Income Inequality)**.** *If men's and women's ability distributions are identical and they have the same career opportunities, then in equilibrium after they choose their careers and their incomes are realized, income inequality among men is higher than income inequality among women: if $F_m(x) = F_w(x)$ and $\Phi_m(\cdot|x) = \Phi_w(\cdot|x)$ for all $x$, then $G_m^*$ is a mean-preserving spread of $G_w^*$.*

## 4.3 Pre-Marital and Post-Marital Career Choices

In the basic model, career and marital choices are connected: one who chooses the risky career marries late, and one who chooses the safe career marries 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.

For an ability $x_m$ man, the four choices respectively yield: (1) $x_m + v_m(x_m)$, (2) $x_m + v_m(x_m)$, (3) $x_m + v_m(x_m + \widehat{\varepsilon}_m | x_m)$, (4) $x_m + \mathbb{E}[v_m(x_m + \varepsilon_m)|x_m]$, 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 of all, 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.

Second of all, let's 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 $\mathbb{E}[s(x_m + \varepsilon_m, y_w)|x_m] = \mathbb{E}[(x_m + \varepsilon)y_w|x_m] = x_m y_w$. 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 that the marital benefits from the risky career come from the possibility to switch partners. The wife a man marries to 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.

**Proposition 4** (Gender Difference in Marriage Timing)**.** *Men choose risky careers and marry late whereas women tend to choose safe careers and marry early.*

Consider the possibility that a man is given the opportunity to gamble with an income change modeled by the random variable $\widehat{\varepsilon}_m | y_m$ after his realized income but he is married to a woman and cannot divorce (or must pay some cost to divorce). For a man who takes a gamble, his utility is

$$\mathbb{E}[y_m + \varepsilon_m | y_m] + [s(y_m + \varepsilon_m, y_w)|y_m] - v_w(y_w).$$

**Proposition 5** (Gender Difference in Effects of Marital Status on Career Choices)**.** *Unmarried men are more likely than married men to choose risky careers, whereas unmarried women are* less *likely than married women to choose risky careers.*

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# A Omitted Proofs and Details

## A.1 Public good provision justifies the 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 utilities. The utilities when they live alone are their reservation utilities $z_m(y_m) = \max_Q (y_m - Q)Q = (y_m/2)^2 = y_m^2/4$ 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 the 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 $v_w$.

# B Extended Model

In the rest of the appendix, we show that even if we extend the model to include women's reproductive fitness as a separate dimension to endogenize the risky career cost $c$, the main results, the propositions, still hold.