# Searching Forever After*

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October 21, 2019

**Abstract**

We study a model of two-sided search in which agents' reasoning is coarse. In equilibrium, the most desirable agents behave as if they were fully rational, while, for all other agents, coarse reasoning results in overoptimism with regard to their prospects in the market. Consequently, they search longer than optimal. Moreover, agents with intermediate match values may search indefinitely while all other agents eventually marry. We show that the share of eternal singles converges monotonically to 1 as search frictions vanish. Thus, improvements in the search technology may backfire and even lead to market failure.

## 1 Introduction

Modern search environments present exciting new opportunities for individuals who are looking for a partner or a job. For instance, social networks such as LinkedIn enable employers to recruit new workers faster than ever before. Mobile applications such as Tinder and Bumble, and online dating sites such as OkCupid and Plenty of Fish allow individuals to find a partner in the swipe of a finger.

*We thank Ariel Rubinstein and Rani Spiegler for helpful comments and suggestions.
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Changes in search technologies have reduced search costs and thickened traditional markets. While the new possibilities may seem exciting at first glance, some individuals can be overwhelmed by the much larger set of options. The effort and patience modern search requires can leave participants frustrated, confused, and exhausted. In particular, according to a survey by Pew Research Center (2016), "One-third of people who have used online dating have never actually gone on a date with someone they met on these sites."[1]

How can improvements in search technologies harm individuals who are looking for a partner or a job? Are decision-making biases exacerbated when markets become thicker and search frictions vanish? To address these and other questions, we study a model of two-sided matching with frictions and non-transferable utility. This type of model has proved useful in understanding decentralized matching markets such as the labor market and the marriage market.[2] In the model, there are two sets of heterogeneous agents, which we refer to as men and women. These agents are ranked according to a trait, which we refer to as value. In each period, a share $\mu$ of the agents are drawn and paired with agents of the opposite sex. Each agent then decides whether to accept the match or not. If both agents accept, they marry and leave the market while if at least one of them rejects, they separate and continue searching. We assume that the agents discount the future at a rate $\delta$ and interpret increases in $\mu$ and $\delta$ as improvements in the search technology as they allow agents to meet more people at a faster rate.

The traditional matching with frictions literature assumes that agents are fully rational and correctly predict who will find them acceptable at each moment in time. Under this assumption, large increases in $\mu$ or $\delta$ enhance the agents' welfare. However, in light of the overwhelmingly large array of options that are ubiquitous in modern matching markets, it makes sense to think that participants in these markets use simplified models of the world to evaluate their prospects.[3] Moreover, the full rationality assumption can be a

[1]Another example is a survey conducted by Hinge (2016), according to which "81% of its users stated that they have never found a long-term relationship on any swiping app."

[2]See Chade, Eeckhout, and Smith, (2017) for a comprehensive review.

[3]Enke and Zimmermann (2017) provide evidence that individuals neglect correlation

bit extreme in the contexts of courtship and even job search, where there is countless evidence of biases and, in particular, overoptimism.

We use the framework of analogy-based expectation equilibrium (Jehiel, 2005) to replace the full rationality assumption with a milder one: players form correct beliefs over the *average probability* with which others find them acceptable. However, they do not take into account the correlation between the likelihood that a person will agree to marry them and the value obtained from this marriage. Thus, in equilibrium, players' beliefs are statistically correct but coarse. These coarse beliefs can be seen as stemming from using a simplified model of other players' behavior or, alternatively, as a limit result of learning from partial feedback.[4]

We extend Jehiel's framework by allowing agents to weigh different histories not only by the frequencies with which they are reached, but also by the probabilities with which the outcomes in these histories are observed.[5] This extension is consistent with interpreting the beliefs as stemming from partial feedback. Specifically, our agents assign lower weights to situations in which they reject a match and higher weights to situations in which they accept one. This captures the idea that, after expressing an interest, people often know whether or not the interest is mutual, but knowing whether a disinterest is mutual or not is less common. This applies to dating as well as to hiring situations. For example, an employer is more likely to know whether a job candidate wants the job if he makes the latter an offer.

We characterize the equilibria of the game and show that, except for a group of agents at the top of the distribution of values who behave as if they were fully rational, all other agents are overoptimistic with regard to the prospect of remaining single and continue to search. The agents' overoptimism follows from two reasons: overestimating the value they obtain in a future marriage

(despite knowing the information-generating process) when problems become more complex. Francesconi and Lenton (2011) find evidence consistent with choice overload in speed dating.

[4]One plausible interpretation is that agents ignore the fact that highly valued people are also very selective in order to avoid having to recognize that some individuals are out of their league (see Bénabou, 2015, for a comprehensive review of motivated beliefs).

[5]When all histories are equally likely to be observed, our model is equivalent to Jehiel (2005) and our results remain valid.

and underestimating the time it will take them to get married.[6]

What are the implications of this overoptimism? Agents who overvalue the prospect of remaining single search longer than optimal. In fact, we show that, in symmetric equilibria, agents with intermediate match values may search indefinitely and remain single forever. By contrast, agents with lower (respectively, higher) match values eventually marry and leave the market. Thus, the extent to which overoptimism harms the agents depends on their match values nonmonotonically.[7]

We find that search frictions mitigate the negative effect that overoptimism has on the agents. In particular, the share of agents who search indefinitely weakly increases when search frictions become less intense and converges monotonically to 1 when agents become infinitely patient. Intuitively, when an agent believes that all other agents are equally "achievable," the greater the number of agents with high match values (s)he expects to meet in the future, the more selective (s)he becomes. Eventually, the agent will reject all agents of her/his caliber as the agent wrongly expects to marry agents with high match values in the future with sufficiently high probability. Thus, improvements in the search technology can make the agents too selective to marry.

*Related Literature*

This paper is related to the matching with frictions literature (see MacNamara and Collins, 1990; Burdett and Coles, 1997; Eeckhout, 1999; Bloch and Ryder, 2000; Shimer and Smith, 2000; Chade, 2001; Adachi, 2003; Chade, 2006; Smith, 2006). This literature focuses on the properties of the induced matching under various assumptions on the search frictions, payoff from marriage, search costs, and the ability to transfer utility. One of the most famous results in this strand of the literature is the "block segregation result," which holds in

[6]Agents at the bottom of the value distribution exhibit only one of these biases.

[7]There is quite a lot of evidence of overoptimism in the context of two-sided search. For example, Bruch and Newman (2018) show that individuals pursue potential partners who are, on average, 25% more desirable than themselves. In a broader context, "Dozens of studies show that people generally overrate the chance of good events, underrate the chance of bad events and are generally overconfident about their relative skill or prospects." (Camerer, 1997).

our setting when agents' are sufficiently *impatient*. For other parameters, we obtain block segregation at the top of the value distribution, but there are equilibria with no block segregation in other parts of the distribution.

We relax the full rationality assumption by introducing a modified version of analogy-based expectation equilibrium (Jehiel, 2005). A related concept, "cursed equilibrium," was developed by Eyster and Rabin (2005) for games of incomplete information. As agents in our model, cursed agents fail to understand the extent to which other players' actions depend on their type. In a related paper, Piccione and Rubinstein (2003) study intertemporal pricing, where consumers think in terms of a coarse representation of the equilibrium price distribution.

Our paper is also related to equilibrium models in which agents neglect selection. Esponda (2008) proposes such a model and shows that agents who do not account for selection can exacerbate adverse selection problems. In Jehiel (2018), agents ignore the lack of feedback on non-implemented projects. This selection neglect leads to overoptimism, as agents form expectations based only on feedback from implemented projects, which, in expectation, are superior to non-implemented ones.

In all of the above behavioral models, agents can be viewed as if they were using a simplified representation of the world to form expectations. For a comprehensive review of equilibrium models in which individuals interpret data by means of a misspecified causal model see Spiegler (2019).

In our model, coarse reasoning is manifested in overoptimism, which leads to over-search. Gamp and Krähmer (2019a) analyze a consumer search model in which a share of the consumers do not understand the correlation between a product's quality and its price. The naive consumers search longer than it is optimal to find a high-quality product at a low price (even if it does not exist), which can solve the Diamond paradox. Gamp and Krähmer (2019b) analyze a consumer search model in which firms choose whether to offer deceptive or candid products and some of the consumers have a coarse understanding of the market, in the sense that they cannot distinguish between deceptive and candid products nor can they infer quality from prices. In their model, the naive consumers buy from the first firm they encounter.

While there are quite a few models that relax the full rationality assumption in the context of consumer search, to the best of our knowledge there are a limited number of papers that relax this assumption in the context of matching with and without frictions. Two exceptions are Eliaz and Spiegler (2013), who analyze a search and matching model where agents exhibit "morale hazard," and Antler (2015), who studies a centralized matching problem in which agents' preferences are sensitive to the institutional setting.

The rest of the paper proceeds as follows. We present the baseline model and two benchmark results in Section 2. Section 3 introduces the behavioral model and its analysis. Section 4 presents two extensions of the model and Section 5 concludes.

# 2 The Baseline Model

There is a set of men **M** and a set of women **W**, each containing a unit mass of agents whose values are distributed on the interval $[\underline{v}, \overline{v}]$, $\underline{v} > 0$ according to an atomless continuous distribution[8] $F$. We denote the corresponding density by $f$ and often refer to a man of value $v$ as man $v$ and to a woman of value $v$ as woman $v$.

In each period, a measure $\mu > 0$ of men and a measure $\mu$ of women are drawn uniformly at random. These men and women are then randomly matched with each other. When a pair of agents are matched, they immediately observe each other's value and choose whether to accept or reject the match. If both agents accept, then they marry, exit the market, and are replaced by two agents with identical characteristics. If at least one of the two agents rejects the match, then they separate and return to the market. When agent $v$ marries agent $v'$, the latter obtains a payoff of $v$ and the former obtains a payoff of $v'$. All agents discount the future at a rate $\delta < 1$ and obtain no utility when single. Agents maximize their expected discounted payoff given

[8] In Section 3.4, we discuss the relaxation of the symmetry assumption and its implications for our results.

their beliefs on the other agents' behavior.

We restrict attention to stationary cutoff strategies. A stationary strategy for agent $v$, $\sigma_v(\cdot) : [\underline{v}, \overline{v}] \to \{Y, N\}$, maps the values of agents on the other side of the market to a decision whether to accept or reject a match. For each agent $v$ and profile $\sigma$, let $A_v(\sigma)$ be the set of agents who accept a match with $v$, let $\hat{A}_v(\sigma)$ be the set of agents whom $v$ accepts matches with, and let $\hat{R}_v(\sigma)$ be the set of agents whom $v$ rejects. We say that agent $v$ uses a cutoff strategy if there exists $\hat{a}_v$ such that $\hat{A}_v(\sigma) = \{v' | v' \geq \hat{a}_v\}$. When there is no risk of confusion, we omit the dependence on $\sigma$ from $\hat{A}_v$, $\hat{R}_v$, and $A_v$ and identify a strategy $\sigma_v$ with its corresponding cutoff $\hat{a}_v$.

## 2.1 Benchmark Results: Full Rationality

In this section, we provide a "rational expectations" benchmark for the analysis. The results in this section follow directly from the analysis in the matching with frictions literature and therefore we omit their formal proofs.

Proposition 1 is a classic block segregation result (see, e.g., MacNamara and Collins, 1990; Coles and Burdett, 1997; Eeckhout, 1999; Bloch and Ryder, 2000; Chade, 2001; Smith, 2006).

**Proposition 1** *There exist numbers $\overline{v} = v^0 > v^1 > v^2 > ... > v^N = \underline{v}$ such that, in the unique equilibrium, every agent $v \in [v^{j+1}, v^j)$ uses the cutoff $v^{j+1}$.*

Proposition 1 establishes that, in equilibrium, the sets of agents are partitioned into *classes*, where agents are said to belong to the same class if they use the same cutoff strategy. This implies that all agents are accepted by members of their class and rejected by all members of higher classes. Thus, all agents marry within their class and no agent remains single forever.

The intuition for the segregation result is as follows. Due to the search frictions, no agent has a reservation value greater than $\delta\overline{v}$. Thus, there exists a threshold $v^1 \leq \delta\overline{v}$ such that if $v \geq v^1$, then all agents find agent $v$ acceptable. Hence, all agents whose value is greater than $v^1$ have the same reservation value, $v^1$. These agents form the *top class* and reject matches with agents whose value is lower than $v^1$. Thus, the latter agents' reservation values must be lower than $\delta v^1$, which implies a cutoff $v^2 \leq \delta v^1$ such that agents whose value is lower than $v^1$ find agents whose value is above $v^2$ acceptable. Agents whose value is between $v^1$ and $v^2$ form the second class as all of these agents have the same reservation value, $v^2$. It is possible to complete the class construction inductively until the entire population of agents is accounted for.

Denote the expected discounted payoff that agent $v$ obtains in equilibrium by $\hat{U}_v$. We interpret increases in $\mu$ and $\delta$ as improvements in the search technology and study their effects on the agents' welfare. The next result shows that sufficiently large increases in $\mu$ and $\delta$ increase the agents' welfare.

**Proposition 2** *For every $v \in [\underline{v}, \overline{v}]$ it holds that $\hat{U}_v \leq v$. Moreover, $\hat{U}_v$ converges to $v$ as $\delta$ and $\mu$ converge to* 1.

The proposition shows that when search frictions vanish, the induced matching converges to the unique stable matching (see Bloch and Ryder, 2000; Adachi, 2003). This implies that every agent marries another agent with the same value. Thus, an agent $v$ whose reservation value is lower than $v$ benefits from a sufficiently large increase in $\mu$ and $\delta$. In equilibrium, every agent's value is strictly greater than her/his reservation value, except for agents at the lower bound of a class. Thus, under the rational expectations model, an arbitrarily large share of the participants are better off when search frictions vanish.

# 3 Coarse Reasoning in the Matching Market

In this section, we depart from the rational expectations model by assuming that agents use a simplified model of the world to assess the likelihood of being accepted as a partner. First, we introduce the behavioral model and establish the foundation for the analysis. Second, we examine which agents marry in equilibrium and how the primitives of the model affect the share of agents who remain single. Finally, we characterize the symmetric equilibria of the game and show existence by construction.

## 3.1 The Behavioral Model

We start by relaxing the assumption that agents have a perfect understanding of other agents' strategies. Our agents have a coarse, yet correct, perception of the other agents' behavior. They understand the frequencies with which the other agents are willing to marry them. However, they neglect the correlation between the other agents' behavior and the other agents' value.

Our behavioral model is adapted from Jehiel (2005), who suggests an elegant framework that incorporates partial sophistication into extensive-form games. In this framework, different contingencies are bundled into analogy classes and the agents are required to hold correct beliefs about the other agents' *average behavior* in every analogy class. These coarse beliefs can stem from *partial feedback* about the other agents' behavior in similar games that were played in the past. One motivation for the agents' coarse beliefs is that obtaining feedback about the aggregate behavior can be easier than gathering information about the time and context in which each match was accepted or rejected.

We modify Jehiel's framework by allowing the agents to weigh different contingencies not only by the frequencies with which they are reached, but also by the probabilities with which the outcomes in these contingencies are observed by the agents. This generalization is consistent with the interpretation of the agents' coarse beliefs as stemming from feedback on the behavior in similar games that were played in the past.[9] In our model, the probability of observing the outcome of a particular contingency is endogenous. Specifically, we assume that an agent $v$ who accepts a match with an agent $w$ observes $w$'s decision (as they marry if $w$ accepts the match) while when $v$ rejects a match with $w$, agent $v$ observes $w$'s decision only with probability $\alpha \in (0, 1]$.

When $\alpha = 1$, agent $v$'s belief matches the rate at which other agents accept agent $v$ and our model is equivalent to Jehiel (2005). When $\alpha < 1$, agents put smaller weights on situations in which they reject other agents. This captures courting and hiring situations in which mutual interest is easier to observe than

[9] Alternatively, the agents may weigh contingencies differently because they think that some contingencies are more relevant than others.

mutual disinterest. As we will show later, the model's results and intuitions hold regardless of whether $\alpha = 1$ or $\alpha \in (0,1)$. Varying the value of $\alpha$ allows us to study how the feedback structure in different markets affects the agents' marriage decisions.

Formally, each agent $v$ believes that every other agent accepts a match with $v$ with probability $\beta_v$. In equilibrium, the probabilities $\beta = (\beta_v)_{v \in M \cup W}$ are consistent with the actual play in the game and reflect the true probability with which other agents are willing to accept a match with agent $v$.

**Definition 1** *Agent $v$'s belief $\beta_v$ is said to be consistent with a profile $\sigma$ if*

$$\beta_v = \frac{\int_{\hat{A}_v(\sigma) \cap A_v(\sigma)} f(x)dx + \alpha \int_{\hat{R}_v(\sigma) \cap A_v(\sigma)} f(x)dx}{\int_{\hat{A}_v(\sigma)} f(x)dx + \alpha \int_{\hat{R}_v(\sigma)} f(x)dx}. \tag{1}$$

**Definition 2** *A pair $(\sigma, \beta)$ forms an equilibrium if each belief $\beta_v$ is consistent with $\sigma$ and each strategy $\sigma_v$ is optimal given $\beta_v$.*

Throughout the analysis, we focus on symmetric equilibria, namely, equilibria in which women and men with the same value use a symmetric strategy. The symmetry in the equilibrium behavior greatly simplifies the notation and makes the exposition clearer. The key results and intuitions remain valid when the equilibrium behavior is asymmetric (or when the distributions of men's and women's values are asymmetric). We discuss and explain the minor differences at the end of this section, after presenting our results.

An agent $v$ who uses a cutoff $\hat{a}_v$ and believes that (s)he will be accepted with probability $\beta_v$ expects to marry in each period with probability $\mu\beta_v(1-F(\hat{a}_v))$. Due to selection neglect, the agent conditions the expected value of a marriage only on her/his own cutoff, thus believing it to be $\frac{\int_{\hat{A}_v} f(x)xdx}{1-F(\hat{a}_v)}$. Therefore, the agent's (perceived) expected payoff at the beginning of each period is

$$U_v = \mu\beta_v(1 - F(\hat{a}_v))E[v'|v' \geq v] + \delta(1 - \mu\beta_v(1 - F(\hat{a}_v))U_v.$$

Rearranging the above equation yields

$$U_v = \frac{\mu\beta_v(1 - F(\hat{a}_v))E[v'|v' \geq v]}{1 - \delta(1 - \mu\beta_v(1 - F(\hat{a}_v))}. \tag{2}$$

An agent $v$ accept a match with agent $w$ if and only if $w \geq \delta U_v$, implying that $\hat{a}_v = \delta U_v$. The following lemma uses this equality to establish that, in equilibrium, agents who are more valued have higher reservation values.

**Lemma 1** *In equilibrium, $\hat{a}_v$ is weakly increasing in $v$.*

**Proof.** Let $v < v^\star$. The use of cutoff strategies implies that agent $v$'s opportunity set is a subset of $v^\star$'s, that is, $A_v \subseteq A_{v^\star}$. If agent $v^\star$ uses agent $v$'s optimal cutoff, then $\beta_{v^\star} \geq \beta_v$, implying that $U_{v^\star} \geq U_v$. Therefore, this inequality holds if $v^\star$ chooses her/his cutoff optimally. Thus, $U_v \leq U_{v^\star}$, implying that $\hat{a}_{v^\star} \geq \hat{a}_v$. ■

The monotonicity of the agents' cutoffs implies that for every agent $v$, there exists an *opportunity value*, $a_v$, such that $cl(A_v) = \{w|w \leq a_v\}$. The use of cutoff strategies implies that $a_v$ is weakly increasing in $v$ as well. Next, we use this concept to understand which agents actually marry in equilibrium.

## 3.2 Who Marries in Equilibrium?

Under the standard rational expectations model, if both sides of the market are symmetric, then all agents marry with strictly positive probability.[10] In our model, the agents' coarse reasoning makes some of them too selective to marry agents of their own caliber. Thus, it can be that on both sides of the market there are agents who do not marry at all. The next lemma provides a condition that will be useful in understanding who these *eternal singles* are.

**Definition 3** *Let $s(v)$ be the discounted payoff of an agent whose opportunity*

[10] Even if the market is asymmetric, all agents on at least one side of the market marry with strictly positive probability.

*value is $v$ and who uses the cutoff $v$, that is,*

$$s(v) := \delta \frac{\mu \frac{\alpha F(v)}{1-(1-\alpha)F(v)}(1-F(v))E[v'|v'>v]}{1-\delta(1-\mu \frac{\alpha F(v)}{1-(1-\alpha)F(v)}(1-F(v))}.$$

**Lemma 2** *Agent $v$ marries in a symmetric equilibrium if and only if*

$$v > s(v). \tag{3}$$

**Proof.** In a symmetric equilibrium, if $\hat{a}_v > v$, that is, if agent $v$ rejects a match with another $v$, then $v$ is accepted only by agents with lower values, implying that $a_v < v$. By the same logic, $\hat{a}_v = v$ implies that $a_v \geq v$ and $\hat{a}_v < v$ implies that $a_v \geq v$. Agent $v$ can marry with strictly positive probability if and only if $\hat{a}_v < a_v$. Thus, agent $v$ marries with strictly positive probability if and only if $\hat{a}_v \leq v \leq a_v$, with at least one strict inequality.

Let $v > s(v)$, implying that agent $v$ strictly prefers to marry another $v$ if $\hat{a}_v = v = a_v$. However, $\hat{a}_v = v = a_v$ cannot hold together with $v > s(v)$ since, in equilibrium, $\delta U_v = \hat{a}_v$. This contradiction implies that if $a_v = v$, then $\hat{a}_v < v$, and because $v$'s payoff is increasing in $a_v$, it follows that $\hat{a}_v < v$ holds if $a_v < v$ as well. Since $\hat{a}_v < v$ implies that $a_v \geq v$ by definition, we can conclude that either $a_v = v$ and $\hat{a}_v < v$, or $a_v > v$ and $\hat{a}_v \leq v$.

Let $v \leq s(v)$. Agent $v$ then weakly prefers to reject another agent $v$ if $\hat{a}_v = v = a_v$. Therefore, if $a_v = v$, then $\hat{a}_v \geq v$, and, by monotonicity, $\hat{a}_v > v$ for $a_v > v$. Since $\hat{a}_v > v$ implies that $a_v < v$ by definition, we can conclude that either $a_v = v$ and $\hat{a}_v = v$, or $a_v < v$ which implies $\hat{a}_v > v$. ■

Lemma 2 establishes a necessary and sufficient condition for an agent to marry in symmetric equilibria. Condition 3 implies that given an opportunity value of $v$, an agent will strictly prefer marrying agent $v$ to remaining single. An agent $v$ for whom $s(v) \geq v$ exhibits a "Groucho Marx" type of behavior, as $v$ is unwilling to marry agents who are willing to marry $v$.

In order to understand the intuition for the condition's necessity, observe that $s(v)$ is weakly lower than the reservation value of a woman who is accepted by men whose value is lower than $v$ and rejected by men whose value is greater than $v$. By the monotonicity of the reservation values, whenever man $v$ is willing to marry woman $w$, her reservation value is weakly greater than $s(v)$. Hence, when $s(v) > v$, woman $w$ prefers remaining single to marrying $v$ and so $v$ cannot marry in equilibrium.[11]

To see why Condition 3 is also sufficient, note that in a symmetric equilibrium, $v$ will not marry only if all agents whose value is greater than $v$ reject $v$ (i.e., $a_v \leq v$). Agent $v$'s reservation value increases in $a_v$ and so, if $v > s(v)$ and $a_v \leq v$, then agent $v$ accepts agents whose value is lower than $v$. As the agents' reservation values are monotone in their values, all agents whose value is lower than $v$ accept $v$ and so $v$ marries in a symmetric equilibrium.

Condition 3 allows us to understand who will marry in equilibrium. As $s(v)$ is continuous and $s(\overline{v}) = s(\underline{v}) = 0$, agents with extreme match values always marry in equilibrium while agents with intermediate match values may search indefinitely. We now use Condition 3 to study the effect of the matching frictions, $\mu$ and $\delta$, and the feedback parameter $\alpha$ on the share of eternal singles in a symmetric equilibrium.

**Proposition 3** *The share of agents who never marry in a symmetric equilibrium weakly increases in $\delta$, $\mu$, and $\alpha$. Moreover, for any $\alpha$ and $\mu$, this share converges to 1 as $\delta$ converges to 1.*

**Proof.** We can write Condition (3) as

$$\frac{1-\delta}{\delta} v > \mu \frac{\alpha F(v)(1-F(v))}{1-(1-\alpha)F(v)} E[v' - v | v' > v]. \tag{4}$$

Note that an agent for whom (4) does not hold cannot marry in equilibrium. The LHS of (4) is decreasing in $\delta$ and so every agent who cannot marry in equilibrium under $\delta$ cannot do so under any $\delta' > \delta$. Moreover, at the $\delta = 1$ limit, the LHS of (4) goes to 0 such that (4) cannot hold for $v \in (\underline{v}, \overline{v})$. Clearly, the RHS of (4) is increasing in $\mu$ and $\alpha$, which completes the proof. ■

[11] When $s(v) > v$, agent $v$ cannot marry regardless of whether the equilibrium is symmetric or not.

Proposition 3 establishes that the share of eternal singles increases when search frictions vanish and as agents' obtain better feedback on matches they reject. What makes the agents so selective when the search frictions vanish? To understand the intuition, consider an agent $v$ who marries in equilibrium. Agent $v$ is accepted by (at least) all agents with a value lower than $v$. No matter what cutoff strategy $v$ uses, $v$ believes that (s)he will be accepted by every agent with a probability weakly higher than $\alpha F(v)$. As search frictions vanish, $v$ expects to encounter more and more agents with high match values and, therefore, $v$ will never accept an agent of her/his own caliber.

In order to understand the effect of the feedback parameter $\alpha$, note that an agent $v$ who marries in equilibrium is accepted by every agent whom $v$ rejects. The higher $\alpha$ is, the higher agent $v$'s perceived probability $\beta_v$ is, as $v$ obtains more "positive feedback" from matches $v$ rejects. When $v$'s perceived probability increases, $v$ becomes more selective to the extent that, for large values of $\beta_v$, agent $v$ is too selective to marry.

## 3.3 Overoptimism and Oversearch

In the previous section, we established that some agents in our model may search indefinitely and never leave the market. This suggests that, in general, agents may be too selective and search longer than optimal. We now show that this is indeed the case. While agents who are accepted by everyone are correct in their predictions and behave as if they were fully rational, all other agents overvalue their prospects in the market and continue their search longer than optimal.

**Proposition 4** *There exists a value $v^1 < \overline{v}$ such that every agent $v \geq v^1$ behaves as if (s)he were fully rational and every agent $v < v^1$ searches longer than optimal. Moreover, $[v^1, \overline{v}]$ is the top class in Proposition 1.*

**Proof.** First, consider the agents' perceived probability of marriage in each period. Agent $v$ expects to accept a match with probability $1 - F(\hat{a}_v)$ and to be accepted in each period with probability

$$\beta_v = \begin{cases} \frac{F(a_v)-F(\hat{a}_v)+\alpha F(\hat{a}_v)}{1-F(\hat{a}_v)+\alpha F(\hat{a}_v)}, & \text{if } a_v \geq \hat{a}_v \\ \frac{\alpha F(a_v)}{1-F(\hat{a}_v)+\alpha F(\hat{a}_v)}, & \text{if } a_v < \hat{a}_v. \end{cases}$$

The correct probability with which agent $v$ is accepted, conditional on $v$ accepting, is

$$\frac{max\{F(a_v) - F(\hat{a}_v), 0\}}{1 - F(\hat{a}_v)}, \tag{5}$$

which is lower than $\beta_v$ unless $a_v = \overline{v}$ or $\hat{a}_v = \underline{v}$.

Second, consider the agents' expected value from marriage. Agent $v$ marries an agent whose expected value is $E[v'|\hat{a}_v \leq v' < a_v]$ but believes that (s)he will marry an agent whose expected value is $E[v'|\hat{a}_v \leq v' \leq \overline{v}]$. The latter value is higher, unless $a_v = \overline{v}$.

Therefore, unless $a_v = \overline{v}$, in which case the agent is correct and behaves optimally, agent $v$'s perceived expected payoff, $U_v$, is higher than the actual one. Hence, the agent's cutoff value, $\hat{a}_v$, is too high as well, since $\hat{a}_v = \delta U_v$. This means that the agent searches longer than optimal, given $a_v$.

Lastly, note that due to search frictions, there must be agents who are accepted by all other agents. By the monotonicity of $a_v$, there exists a value $v^1$ such that $a_v = \overline{v}$ for $v \geq v^1$ and $a_v < \overline{v}$ for $v < v^1$. ■

Agents who are accepted by all other agents behave as if they were fully rational. They correctly predict the time it will take them to marry and their partner's expected value. The reason that these agents are unaffected by selection neglect is that for these agents, there is no selection, namely, all other agents are equally (non)selective with regard to these agents.

All other agents are affected by their neglect of the fact that agents who are more valued are also more selective. There are two reasons why this neglect can make agents search longer than optimal: overestimation of the expected value of their potential partner in a future marriage and underestimation of the time it will take them to get married.

Agents overestimate the expected value of their potential partner because they believe that all agents are equally achievable and, therefore, they believe that they are equally likely to marry any agent whom they accept. However, since agents who are more valued are also more selective, agents either remain single forever or marry an agent whose expected value is lower than the expected value of the matches they accept.

Agents underestimate the time it takes them to get married since they overestimate the rate of a mutual match acceptance. Recall that our agents average over all possible partners when they form expectations (on the rate at which others find them acceptable). They mistakenly include potential partners that they themselves reject but are accepted by, which raises the acceptance rate. Our agents also mistakenly include agents they accept but are rejected by, which lowers the acceptance rate. It turns out that the more dominant mistake is the first. Hence, our agents include too many observations in which they are accepted, which induces overestimation of the probability of marriage in each period.[12]

## 3.4 Characterization and Existence

In this section, we focus on the structure and existence of the equilibria of the model. We construct a symmetric equilibrium in which there is block segregation. The construction shows that, in general, there are an infinite number of such equilibria but, by Condition 3, the set of agents who marry in equilibrium is unique. We conclude this section by relaxing the symmetry assumption and illustrating the structure and properties of such equilibria.

In constructing the symmetric equilibria, we use the fact that Condition 3 allows us to partition $[\underline{v}, \overline{v}]$ into maximal intervals in which either all agents marry (marriage intervals) or none do (singles intervals). We treat each interval separately and partition them into a potentially infinite number of *classes*, in which all agents share the same reservation and opportunity values.

As in the rational case, a top class exists and it is possible to construct

[12] When $\hat{a}_v = \underline{v}$, agent $v$ correctly predicts the time it will take her/him to marry as there is no selection along this dimension.

a sequence of classes that starts from it. However, unlike in the rational case (unless $\delta$ is sufficiently small), the sequence will not cover $[\underline{v}, \overline{v}]$ and will converge to the highest value $v^\star$ such that $s(v^\star) = v^\star$ instead. That is, the classes cover only the top marriage interval.

The main challenge in the proof is that, unlike in the top marriage interval (and unlike in the rational case), in any other interval there is no upper class from which we can start the construction. Nevertheless, we show that it is possible to define an arbitrary initial class in the interior of each of these intervals and construct two unique sequences of classes on each of the initial class' sides. The sequences cover the interval and converge to its end points. Such freedom in defining the initial class implies that there are an infinite number of equilibria once the partition includes more than one interval. There is no such freedom in the top marriage interval (or in the rational expectations model) due to the uniqueness of the upper class.

Formally, by Condition 3, we know that one can partition $[\underline{v}, \overline{v}]$ into maximal intervals in which agents either eventually marry or remain single forever. We say that $L$ is a *marriage interval*, if $L$ is a maximal interval such that $s(l) < l$ for all $l \in$ Ł. An interval $L$ is said to be a *singles interval* if either $s(l) > l$ for all $l \in L$, or $s(l) = l$ for all $l \in L$. In the latter case, $L$ is often a singleton. Denote $[\underline{l}, \overline{l}] := cl(L)$.

We say that $C = [\underline{c}, \overline{c}]$ is a *class* if either $C = cl(\{v|\hat{a}_v = \underline{c}\}) = cl(\{v|a_v = \overline{c}\})$ or $C = cl(\{v|\hat{a}_v = \overline{c}\}) = cl(\{v|a_v = \underline{c}\})$. Thus, in each class, the agents share identical cutoff rules and opportunity values. We refer to classes contained in marriage intervals as *marriage classes* and to classes contained in singles intervals as *singles classes*.

The following lemma is key in establishing that, in equilibrium, if an interval $L$ contains one class, then $L$ is covered by classes.

**Lemma 3** *In equilibrium, if an interval $L$ contains a class $C$, then (i) $L$ contains a unique class $C'$ such that $\overline{c} = \underline{c'}$, unless $\overline{c} = \overline{v}$, and (ii) $L$ contains a unique class $C''$ such that $\overline{c''} = \underline{c}$, unless $\underline{c} = \underline{v}$.*

**Proof.** Assume that $C$ is a marriage class and $\overline{c} \neq \overline{v}$. By the definition of a class, for any agent $v > \overline{c}$, $\hat{a}_v \geq \overline{c}$. Since $C$ is in a marriage interval, $\lim\limits_{v\to\overline{c}^+} \hat{a}_v = \overline{c}$. There exists a unique value $a_{\overline{c}} > \overline{c}$ such that $\lim\limits_{v\to\overline{c}^+} a_v = a_{\overline{c}}$ for which $\lim\limits_{v\to\overline{c}^+} \hat{a}_v = \overline{c}$ is optimal. By the definition of $a_{\overline{c}}$ and monotonicity, $\hat{a}_v = \overline{c}$ for any $v \in (\overline{c}, a_{\overline{c}})$. This implies that $a_v = a_{\overline{c}}$ for all such $v$. Therefore, $C' = [\overline{c}, a_{\overline{c}}]$ is a class.

Assume that $C$ is a singles class and $\overline{c} \neq \overline{v}$. For any $v > \overline{c}$, $a_v \geq \overline{c}$. Since $C$ is in a singles interval, $\lim\limits_{v\to\overline{c}^+} a_v = \overline{c}$. There exists a unique value $\hat{a}_{\overline{c}} > \overline{c}$ such that $\lim\limits_{v\to\overline{c}^+} \hat{a}_v = \hat{a}_{\overline{c}}$ is optimal given $\lim\limits_{v\to\overline{c}^+} a_v = \overline{c}$. By the definition of $\hat{a}_{\overline{c}}$, $a_v = \overline{c}$ for any $v \in (\overline{c}, \hat{a}_{\overline{c}})$. This implies that $\hat{a}_v = \hat{a}_{\overline{c}}$ for all such $v$. Therefore, $C' = [\overline{c}, \hat{a}_{\overline{c}}]$ is a class.

The proofs for the existence of $C''$ follow the same logic and are omitted for brevity. ■

By Lemma 3, if an interval $L$ contains a finite number of classes, then $L = [\underline{v}, \overline{v}]$. Moreover, an infinite sequence of classes must converge to some $v$ satisfying $s(v) = v$. Thus, if $cl(L) = [\underline{l}, \overline{l}]$ then either $\underline{l} = \underline{v}$ or $s(\underline{l}) = \underline{l}$, and either $\overline{l} = \overline{v}$ or $s(\overline{l}) = \overline{l}$. The next corollary follows immediately.

**Corollary 1** *If an interval $L$ contains one class, then $L$ is covered by classes.*

In equilibrium, there must be two sets of agents, one on each side of the market, who are accepted by all the other agents. The set of agents who are accepted by all the other agents on one side of the market must have a common cutoff strategy, i.e., a joint $\hat{a}_v$, which, in turn, defines the set of agents who are accepted by all the other agents on the other side of the market. These two sets of agents are uniquely determined by the distribution $F$. Thus, Proposition 4 and Corollary 1 imply the following Corollary.

**Corollary 2** *In equilibrium, the highest marriage interval is covered by classes in a unique manner.*

If $\delta$ is sufficiently low such that $s(v) > v$ for all $v$, implying that all agents marry in equilibrium, then Corollary 2 establishes that the equilibrium is unique. Otherwise, the equilibrium is uniquely defined over the highest marriage interval.

In the following proposition, we show, by construction, that an equilibrium exists. This is established by defining an arbitrary class in each interval (except the highest) and then covering each interval with additional classes.[13] This construction highlights the fact that the equilibrium is not unique whenever there is more than one interval. Nonetheless, the set of agents who remain single in equilibrium is unique.

**Proposition 5** *A symmetric equilibrium exists.*

**Proof.** For any point $v$ for which $s(v) = v$, set $\hat{a}_v$. The following construction will ensure that $a_v = v$ as well. By definition, $\hat{a}_v = v$ is optimal given $a_v = v$. In the remainder of the proof, singles intervals are assumed to contain only agents with $s(v) > v$.

Let $L$ be a maximal interval that does not contain $\underline{v}$ or $\overline{v}$, and let $a \in int(L)$ and $\epsilon \in \mathbb{R}$. Define $v = a + \epsilon$. Consider $v$'s discounted payoff, $\delta U_v$, as a function of $\epsilon$, assuming that $\hat{a}_v = v$ and $a_v = a$. If $L$ is a marriage interval, then for $\epsilon = 0$, $\delta U_v < v$. For $\epsilon = \underline{l} - a$, $\delta U_v > \underline{l} = v$ ( $\underline{l}$'s payoff when $a_{\underline{l}} = \hat{a}_{\underline{l}} = \underline{l}$ is $\underline{l}$). If $L$ is a singles interval, then for $\epsilon = 0$, $\delta U_v > v$. For $\epsilon = \overline{l} - a$, $\delta U_v < \overline{l} = v$ ( $\overline{l}$'s payoff given $a_{\overline{l}} = \hat{a}_{\overline{l}} = \overline{l}$ is $\overline{l}$). In either case, the payoff is continuous in $\epsilon$ and, therefore, for some $\epsilon$, $\delta U_v = v$. Note that $v \in L$.

Consider now the dual exercise: let $L$ be a maximal interval that does not contain $\underline{v}$ or $\overline{v}$, and let $w \in L$. If $L$ is a marriage interval, consider $a \in [w, \overline{l}]$ and find a $v$ as in the previous paragraph. For $a = w$, $v < w$. For $a = \overline{l}$, $v = \overline{l} > w$. If $L$ is a singles interval, consider $a \in [\underline{l}, w]$ and find a $v$ as in the previous paragraph. For $a = w$, $v > w$. For $a = \underline{l}$, $v = \overline{l} < w$. In either case, by continuity, there exists an $a$ such that $v = w$. Note that $a \in L$.

Thus, given any $v \in L$ we can find an interval $[v, a] \in L$, such that $v$ is the optimal cutoff given $a$, and an interval $[\hat{a}, v] \in L$, such that $\hat{a}$ is optimal given $v$. Arguments for the existence of an interval of the first type for $L$ not containing $\overline{v}$ and an interval of the second type for $L$ not containing $\underline{v}$ are similar and omitted for brevity.

[13] It is also possible to construct equilibria with no classes, except in the highest interval.

Let $L$ be a maximal interval that does not contain $\underline{v}$ or $\overline{v}$, and let $c^0 \in int(L)$. For $k = 1, 2, ...,$ let $c^k$ be the value for which $\delta U_v = c^{k-1}$ if $\hat{a}_v = c^{k-1}$ and $a_v = c^k$. For $l = 1, 2, ...,$ let $c^l$ be the value for which $\delta U_v = c^{-l}$ if $\hat{a}_v = l^{-l}$ and $a_v = c^{1-l}$. Note that both series $\{c^k\}_{k\in\mathbb{N}}$ and $\{c^l\}_{l\in\mathbb{N}}$ are bounded by $L$ and monotonic, and hence converging. At the limit, $v$, it must hold that $v = a_v = \hat{a}_v$. Thus, $v \in \{\underline{l}, \overline{l}\}$. For $k \in \mathbb{Z}$, define $C^k = [c^k, c^{k+1})$. Note that the sets $\{C^k\}_{k\in\mathbb{Z}}$ are disjoint and cover $int(L)$. Set $\hat{a}_v = c^k$ for any $v \in [c^k, c^{k+1})$, $\hat{a}_{\underline{l}} = \underline{l}$, and $\hat{a}_{\overline{l}} = \overline{l}$

Let $L$ be a maximal interval containing $\overline{v}$. Set $c^0 = \overline{v}$. For any $l = 1, 2, ...,$ let $c^l$ be the value for which $\delta U_v = c^{l-1}$ if $\hat{a}_v = c^{-l}$ and $a_v = c^{1-l}$. In the case of $c^{-l} \leq \underline{v}$, set $c^{-l} = \underline{v}$ and stop the process. Define $C^l = [c^l, c^{l+1})$ for $l = 1, 2, ...$ . As in the previous case, the sets $\{C^{-l}\}_{l\in\mathbb{N}}$ are disjoint and cover $int(L)$. Set $\hat{a}_v = c^{-l}$ for any $v \in [c^{-l}, c^{1-l})$ and $\hat{a}_{\overline{v}} = c^{-1}$.

Let $L$ be a maximal interval containing $\underline{v}$ but not $\overline{v}$. Set $c^0 = \underline{v}$. For any $k = 1, 2, ...,$ let $c^k$ be the value for which $\delta U_v = c^{k-1}$ if $\hat{a}_v = c^{k-1}$ and $a_v = c^k$. Define $C^{k-1} = [c^{k-1}, c^k]$ for any $k = 1, 2...$ . Set $\hat{a}_v = c^{-1}$ for any $v \in [c^{k-1}, c^k)$ and $\hat{a}_{\underline{v}} = c^0$.

By construction, for any $v$ in any interval $L$, if $\hat{a}_v = c^k$ for some $k$, then $a_v = c^{k+1}$. Furthermore, this $\hat{a}_v$ is optimal given $a_v$. Thus, an equilibrium exists. ■

To conclude, the following proposition summarizes our results:

**Proposition 6** *Fix $\mu$ and $\alpha$. There exists $\overline{\delta}$ such that:*

1. *If $\delta \geq \overline{\delta}$, then (i) there exist an infinite number of symmetric equilibria, and (ii) there is a set of agents with intermediate match values who do not marry in any equilibrium.*

2. *If $\delta < \overline{\delta}$, then (i) there exists a unique equilibrium and (ii) all agents marry in equilibrium.*

*For every $\delta$, there exists a top class, $C^0$, that is identical to $C^0$ in the benchmark case of Proposition 1.*

**Comment: Symmetry in the model**

Throughout the analysis, we imposed symmetry along two dimensions: we focused on symmetric equilibria and assumed that the men's and women's values are drawn from identical distributions. These assumptions allowed us to convey the main messages while keeping the exposition simple. However, our key insights are not sensitive to these assumptions. Since the implications of both types of asymmetry are similar, we focus our discussion on the case where the distributions of values are symmetric but the equilibrium is not.

The condition $s(v) \leq v$ remains necessary for marriage as, if $s(v) > v$ and man (woman) $v$ accepts a match with woman (man) $w$, then all men (women) whose value is lower than $v$ accept $w$ and so $w$ rejects the match with $v$. Moreover, as Proposition 3 shows, $s(v)$ increases in $\delta, \mu$, and $\alpha$. Thus, the key insights of the paper remain valid.

The main change when we relax the symmetry assumption is that Condition 3 is no longer sufficient for marriage. As an illustration, let $F$ be such that $s(v) = v$ for some $v$ and denote that lowest such $v$ by $v^\star$. Construct a symmetric equilibrium as in Proposition 5 and make the following two modifications: set $\hat{a}_v = v^\star$ for all women with $v \in [\underline{v}, v^\star]$ and $\hat{a}_v = \underline{v}$ for all men with $v \in [\underline{v}, v^\star]$. Note that (1) $a_v = v^\star$ for all women with $v \in [\underline{v}, v^\star]$, which implies that $\hat{a}_v = v^\star$ is optimal for these women and (2) $a_v = \underline{v}$ for all men with $v \in [\underline{v}, v^\star]$, which implies that $\hat{a}_v = \underline{v}$ is optimal for these men. For all other agents, the opportunity and reservation values remain as in Proposition 5 and so the profile we described is an equilibrium in which low-valued agents never marry (unlike in a symmetric equilibrium, in which low-valued agents do marry).

The equilibrium we constructed highlights a general property: in a symmetric equilibrium, agents are partitioned into marriage and singles intervals, based on whether $s(v) \geq v$ or $s(v) < v$ in each interval. In an asymmetric equilibrium, it is possible to turn every marriage interval into a singles interval, except for the top marriage interval. Agents in that interval behave as in a symmetric equilibrium (as Corollary 2 still applies and these agents' behavior is pinned down by the top class). Thus, the set of agents who marry in a symmetric equilibrium is a superset of the agents who marry in an asymmetric equilibrium.

# 4 Extensions

In this section, we modify the baseline model along two dimensions and examine the implications for our results. First, we consider a model in which one side of the market consists of fully rational agents while agents on the other side of the market are boundedly rational. We show that the existence of the fully rational agents can lead to unraveling. We then focus on a case where agents obtain no feedback from matches they reject and show that, as in the previous sections, agents overestimate the value of their potential partner. However, they do not underestimate the time it will take them to marry. As a result, agents search longer than optimal but eventually all of them marry.

## 4.1 One-Sided Full Rationality

Consider a case in which agents on one side of the market are fully rational, while on the other side of the market the agents' reasoning is coarse. This setting corresponds to hiring situations, where workers might be partially sophisticated while firms invest more resources in gathering information and analyzing the market.

A natural question is whether the existence of the fully rational agents on one side of the market alleviates the problem of oversearch or not. The next result shows that not only is the answer to this question negative, but, in fact, the share of eternal singles is greater when one side of the market is fully rational.

**Proposition 7** *Suppose that every $v \in W$ is fully rational and assume that $s(v^\star) > v^\star$ for some $v^\star < \overline{v}$. In equilibrium, all women whose value is lower than $v^\star$ never marry.*

**Proof.** Observe that Lemma 1 still applies (to both sides of the market). Consider woman $v^\star$. If she accepts a man $\tilde{v}$, then every woman whose value is lower than $v^\star$ accepts man $\tilde{v}$ and so $\delta U_{\tilde{v}} \geq s(v^\star) > v^\star$. Thus, man $\tilde{v}$ rejects woman $v^\star$. It follows that woman $v^\star$ cannot marry in equilibrium. Hence, no man ever accepts woman $v^\star$, as otherwise she could deviate to accept that man. By monotonicity, no man ever accepts a woman $w < v^\star$. ■

Proposition 7 shows that even rational agents who are fully aware of the boundedly rational agents' overselectiveness may find themselves forever single. In fact, compared to the case where $W$ contains boundedly rational agents, fewer women marry when all women are fully rational (as, when women are only partially sophisticated, women at the bottom of the value distribution do marry).

The intuition for Proposition 7 is as follows. Fully rational agents react to the overselectiveness of agents on the other side of the market by lowering their own standards. If agents of their own caliber reject them, they turn to lower-valued agents (unlike boundedly rational agents who do not expect difficulty in matching with agents of their own caliber). The fully rational agents' lower standards raise the standards of lower-valued boundedly rational agents, thereby exacerbating the problem: the low-valued boundedly rational agents become even more overoptimistic as they are accepted by higher-valued rational agents and refuse to marry these agents as well. This process leads to unraveling as, eventually, higher-valued women will accept all men while even the lowest-valued man will be unwilling to marry them.

## 4.2 No Feedback from Rejected Matches ($\alpha = 0$)

Our agents estimate the acceptance likelihood of a potential match by observing, and averaging over, agents they both reject and accept. In this section, we consider the extreme case in which agents do not observe whether agents they reject accept them or not. In other words, agents form their expectation solely by observing the acceptance rate of agents they accept themselves. Formally, in this section we assume that $\alpha = 0$. Thus,

$$\beta_v = \frac{\int_{\hat{A}_v(\sigma) \cap A_v(\sigma)} f(x)dx}{\int_{\hat{A}_v(\sigma)} f(x)dx} = \frac{max\{F(a_v) - F(\hat{a}_v), 0\}}{1 - F(\hat{a}_v)}. \tag{6}$$

Note that $\beta_v$ is the correct average probability that agents whom $v$ finds acceptable accept $v$ in return. Thus, there is no selection neglect along the probability dimension.

At this point, a conceptual issue may arise: how should an agent form a belief about the behavior of agents they reject and never observe? We follow the leading example in Esponda (2008) and assume that agents extrapolate from the data they do observe in equilibrium and believe that the agents they reject find them acceptable with probability[14] $\beta_v$.

An agent who marries in equilibrium, has a perceived expected payoff of

$$U_v = \frac{\mu[F(a_v) - F(\hat{a}_v)]E[v'|v' \geq v]}{1 - \delta(1 - \mu[F(a_v) - F(\hat{a}_v)])}. \tag{7}$$

When $\alpha = 0$, agents may still overestimate the value of a potential marriage as they think that other agents are equally achievable. The selection neglect along the value dimension makes them overselective and leads them to search longer than optimal.

An agent who does not marry in equilibrium obtains a correct perceived payoff of 0. The next result shows that this cannot happen in equilibrium: even though most agents suffer from selection neglect, overvalue the prospect of remaining single, and search longer than optimal, all agents eventually marry and there is block segregation.

**Proposition 8** *Fix $\alpha = 0$. There exists a unique equilibrium in which all agents marry and the block segregation result holds. In this equilibrium, there is a value $v^1 < \overline{v}$ such that every agent $v \geq v^1$ behaves as if (s)he were fully rational and every agent $v < v^1$ searches longer than optimal.*

The proof of Proposition 8 is by construction and follows the same logic as in previous proofs: there exists a unique upper class (identical for any $\alpha$). Additional classes are then constructed in a unique manner. As the proof follows directly from Corollary 2, it is omitted.

[14]Our subsequent results do not rely on this assumption.

The key difference between the case of $\alpha = 0$ and that of $\alpha > 0$ is the lack of eternal singles in the former case. When there is no selection neglect along the probability dimension, if there were an "eternal single" $v$, then $v$ would conclude that (s)he will marry with probability 0. Thus, $v$ would adjust $\hat{a}_v$ to $\underline{v}$ and accept matches with all agents, which would lead $v$ to marry.

# 5 Concluding Remarks

We studied a model of two-sided search with nontransferable utility and agents who use a coarse model of the world to assess their prospects. We found that the most desirable agents behave as if they were fully rational while all the other agents overvalue the option of remaining single. This problem is most severe for agents with intermediate match values, who, if the search frictions are not too intense, search indefinitely.

Throughout the analysis we assumed that agents who marry obtain the value of their spouse or, in Burdett and Coles' (1997) words, "Looking in the mirror to admire one's own pizzazz does not increase utility." While this is natural in some contexts, there is some complementarity between partners in other contexts. The main results and intuitions of the paper hold in some settings in which partners complement each other (e.g., when the payoff function is multiplicatively separable, as analyzed in Eeckhout, 1999). In fact, as long as agents who are more valued are also more selective (which is necessary in any form of assortative mating) our qualitative results hold.[15]

A key insight of this paper is that when agents are not fully rational, technological advancement that thickens markets and allows agents to search faster can make them worse off. The improvements in the search technology exacerbate the agents' biases and increase their overselectiveness. This insight is particularly important in designing modern search environments where agents may be overwhelmed by the wide variety of possibilities, which can lead them to use simplified models of the world.

[15] To see this, note that the structure of Condition 3, which is the cornerstone of our analysis, depends only on the monotonicity of the agents' reservation values.

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