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Extended Abstract

Selectivity is a key criterion by which we judge caliber in many pairwise matching markets with uncertain types, such as students sorting at colleges and papers at journals. For instance, U.S. News and World Report puts 12.5% weight on acceptance rates in its annual "Best Colleges" rankings. Yet selectivity is by no means an obvious measure. For while better colleges (or journals) have higher standards, they also get better applicants (or submissions). Must the standards effect dominate in this tradeoff?

This project explores this tradeoff in the simpler market matching papers at journals. We develop and explore a new model of directed search by authors applying to journals. We assume a unit mass of authors, each with a paper whose quality $x > \underline{x} > 0$ has a continuous density $f(x)$. Authors must choose a unique journal to submit their paper to, just once, for simplicity. Journals, by contrast, are equilibrium objects: A journal does not observe quality, but rather noisy referee reports (signals) of papers, and rejects papers with weak enough referee reports. A new journal arises if it can attract papers equal to its promised *caliber* $v > 0$, which is the promised average quality of its accepted papers. Thus, our model has a continuum of journal calibers, matching the continuum of paper qualities.

Journals each observe a noisy signal of the quality of each submitted paper, drawn from a *location family* (with density g and cdf G) centered about the paper quality x. This density is log-concave. Each journal v accepts any paper whose signal surmounts its announced admission thresholds $\theta(v)$, and so rejects a quality x paper with chance $G(\theta(v)-x)$. Formally, we explore a *rational expectations equilibrium* where caliber announcements are ex post valid. An author's payoff is v if his paper is accepted at a journal of caliber v, and zero otherwise. Authors maximize their expected payoff.

In the first benchmark model, an author knows his paper's quality. Under our log-concavity assumption on g, a standard "cream-skimming" argument rules out pooling equilibria, and so higher author types submit to higher caliber journals. Naturally, admission thresholds also rise in caliber. Hence, an author of quality x submits to the journal of whichever caliber v maximizes expected payoff $(1 - G(\theta(v) - x)) \cdot v$, and *rational expectations* requires $x = v$. In the spirit of the solution of the sealed bid first price auction, the admission threshold

satisfies the *equilibrium first order condition*:

$$\theta'(v) = \frac{1}{v}\frac{1 - G(\theta(v) - v)}{g(\theta(v) - v)} \tag{1}$$

Our goal is to understand the *equilibrium rejection rate $R(v) = G(\theta(v) - v)$.*

Proposition 1 (Hump-Shaped Rejection Rates) *The equilibrium rejection rate is hump-shaped in the journal caliber v if the least paper quality $\underline{x}$ is small enough.*

This result defeats selectivity as a smart measure of journal caliber. For while rejection rates rise in caliber at low qualities, they are *falling in caliber* at high qualities. To understand why, let's index journals by their acceptance thresholds θ. Now, the equilibrium rejection rate increases in caliber iff *toughness $\tau(v) = \theta(v) - v$* does. In other words, the slope of the admission threshold exceeds one: $\theta'(v) > 1$. Inversely, this means the rate of increase in caliber is less than one: $v'(\theta) < 1$. Hence, if rejection rates are everywhere rising, then the rate of increase in caliber $v'(\theta)/v(\theta)$ vanishes as caliber explodes. But this violates optimality: For since the author cares about acceptance rate times caliber, the equilibrium journal caliber must rise proportionately as fast as the acceptance rate falls.

The paper next turns to the case where authors themselves are unsure of their paper qualities. Realistically, an author observes only a noisy signal realization ζ of his paper quality x. We assume this signal also hails from some log-concave location family, say with density h. As before, authors submit to whichever journal caliber v maximizes their expected journal caliber times the acceptance rate. Now the rational expectations conditions is more subtle, since each journal receives a continuum of paper qualities. In equilibrium, a journal's promised caliber must match the average quality of submitted *and* accepted papers.

We impose the stronger (but commonly satisfied) assumption that the prior f and author distribution h are *decreasingly log-concave.* We find that hump-shaped equilibrium rejection rates again emerge, provided that authors are sufficiently well-informed relative to journals:

Proposition 2 (Hump-Shaped Rejection Rates, Revisited) *The equilibrium rejection rate is hump-shaped in journal caliber if the dispersion in the author signal density h is sufficiently small relative to the dispersion in the journal signal density g. Otherwise, the rejection rate is monotonic increasing in the journal caliber.*

This result subsumes Proposition 1 as a limit case, namely, as authors' signal grows increasingly accurate — specifically, as the author signal density h dispersion vanishes.
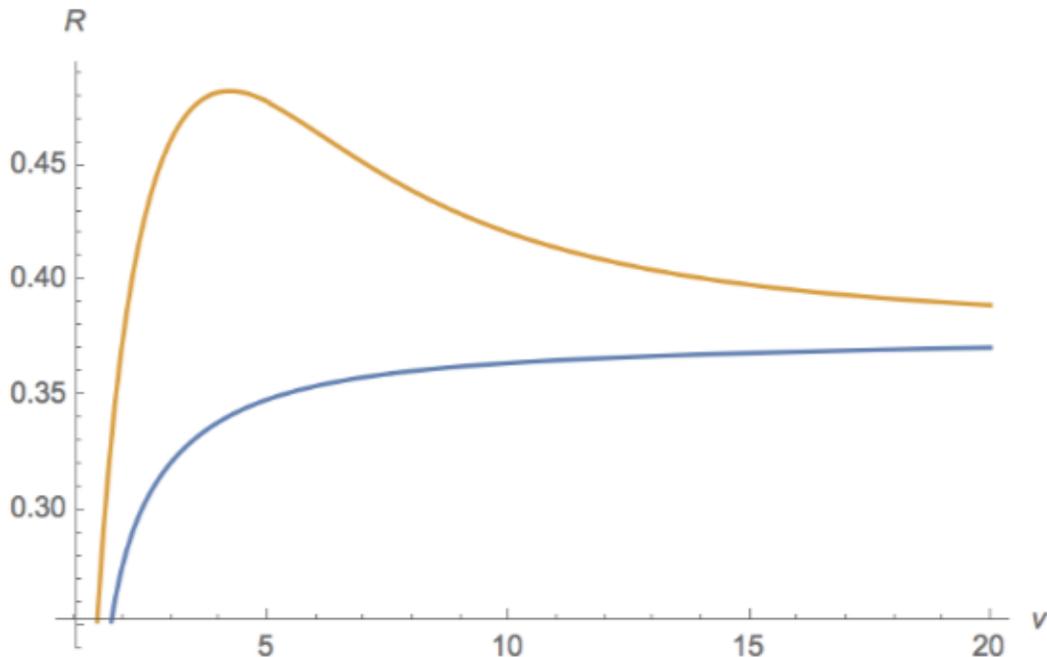
Figure 1: **Equilibrium Rejection Rates with Gamma Signals** The increasing blue curve plots equilibrium rejection rates when the author and journal signal distributions are both $\Gamma[2,1]$. The hump-shaped orange curve emerges when the journal distribution grows more dispersed, to $\Gamma[2,2]$. This illustrates Proposition 2.

Proposition 3 (Equilibrium Comparative Statics) *As journal signal noise increases, the equilibrium rejection rate $R(v)$ increases, and the peak of its hump increases.*

The hallmark of frictional markets is that exchange is mediated by transaction probabilities rather than prices. In this paper, we uncover a key property of such probabilities. Our model also takes seriously the idea underlying the Spence education signaling model that college has no value added, for instance, but it is simply a screening exercise. Rather than a deterministic education choice constituting the signal of caliber, we simply assume a random variable centered about the agent's true talent.
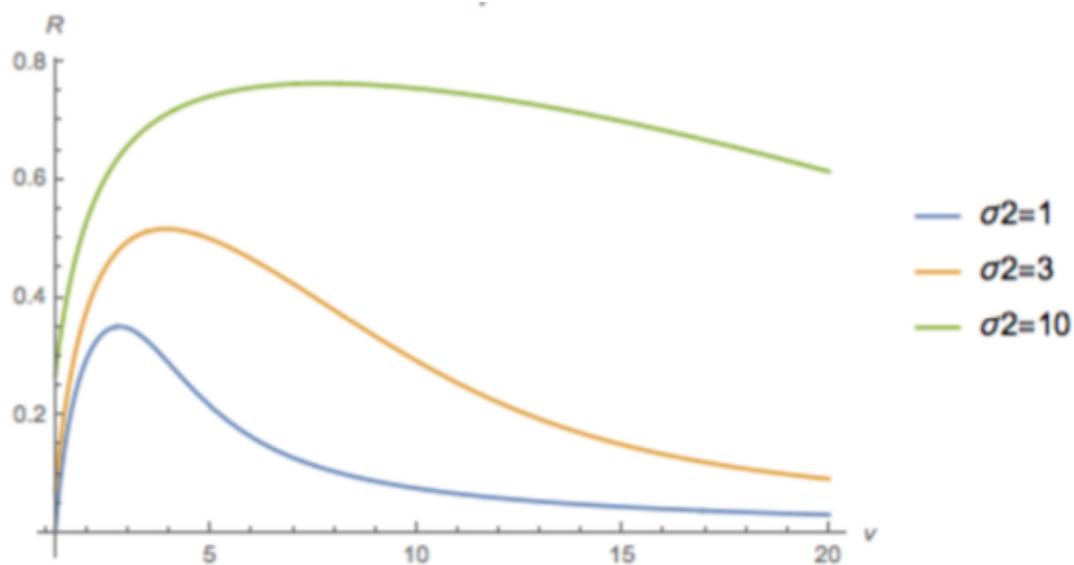
Assume an improper uniform prior f, standard normal author signal distribution, and journal signal as above.

Figure 2: **Gaussian Example** For an improper uniform prior and standard Normal author distribution, rejection rates rise and peak later as the Gaussian journal distribution grows more dispersed. This illustrates Proposition 3.