

# Author Order and Research Quality

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We observe a great deal of heterogeneity in the manner in which author orderings are assigned both *across* and *within* academic markets. To better understand this phenomenon, we develop and analyze a stochastic model of author orderings. In our model, authors work equally hard to obtain priority in listings but final contributions are stochastic. Further, research outlets differ in their quality hurdles. In this setting, our simulation results are consistent with two empirical regularities. First, we find that the rate of alphabetization *increases* with the stringency with which papers are accepted for publication. Second, conditional on clearing the publication hurdle, quality *increases* with alphabetization. These findings arise because increases in the publication hurdle make it more likely that authors will exceed this threshold only when both contribute a high amount. This, in turn, leads to roughly equal contributions (alphabetization) and also generates a positive correlation between alphabetization and quality.

**JEL Classification:** A10, J20, Z00

## 1. Introduction

The assignment of property rights is an integral aspect of any free-market economic system. Indeed, it is well known that property rights matter and that better specified property rights lead to higher output and productivity. Curiously, the assignment of intellectual property rights in academic markets, as manifested by author orderings, exhibits a substantial amount of heterogeneity. We observe this heterogeneity both *across* and *within* various academic disciplines.

Consider first the comparison *across* disciplines. Nearly 90% of the papers published in major economics journals such as the *Journal of Political Economy* (*JPE*), *American Economic Review* (*AER*), and the *Quarterly Journal of Economics* (*QJE*) use alphabetized listings (Engers et al. 1999). In contrast, only about 30% of the papers published in major biological journals such as *Biological Bulletin*, *Quarterly Review of Biology*, and the *Journal of Experimental Biology* employ alphabetized listings (Laband and Tollison 2000). These differences in author orderings are statistically significant, even when the comparison is restricted to works completed by two-author teams. A further examination of author attributions across academic disciplines confirms the extent of heterogeneity across disciplines. Table 1 (reproduced from Engers et al. 1999) reports findings pertaining to the rates of alphabetization across several academic disciplines. The disciplines examined include economics and seven additional academic disciplines. Interestingly, we observe that while those disciplines closest to economics (finance, economic history, and law) exhibit the same lexicographic convention,

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## 5. Concluding Comments

The American Psychological Association has a formal policy on author order that states: “Credit is assigned to those who have contributed to a publication, in proportion to their contribution, and only to these. . . . The experimenter or author who has made the major contribution to a publication is identified as the first listed” (Over and Smallman 1973, p. 161). Other disciplines are less forthcoming in this regard. For example, to the best of our knowledge, the major publication societies within marketing (American Marketing Association, Association of Consumer Research, and College of Marketing of the Institute for Operations Research and the Management Science [INFORMS]) do not have an explicit policy with respect to author listings.

Our theoretical results, as well as the empirical findings of Laband and Tollison (2002), suggest that mandating priority in author listings is unlikely to enhance research quality. The empirical phenomena seem to be captured by a process in which authors appear to work hard to capture priority in listings, but are apparently constrained by the stochastic nature of the creative process. Thus, despite the marked heterogeneity in listing practices, it is incorrect to assume that some academic markets are less forthcoming in prioritizing contributions.

Laband and Tollison (2002) also report that rates of alphabetization for a broad spectrum of scientific journals have changed over the period 1974–1999.<sup>7</sup> Some journals, such as the *Academy of Management Journal*, *American Psychologist*, *American Political Science Review*, and the *Journal of Finance*, have seen marked increases in the rate of alphabetization. Given the positive link between alphabetization and the quality hurdle found in our research, this might be interpreted as reflecting well on these journals. As such, even though alphabetization seems uninformative, such a development might be welcomed by these journals’ respective editors. In contrast, editors of journals that have seen a decline in alphabetization may consider evaluating whether such a trend signals a decline in its prestige.

In conclusion, our research provides one plausible conceptualization of the mechanism underlying the assignment of intellectual property rights in academic markets. It builds on the understanding provided by the extant theoretical research on the topic and is consistent with empirical regularities established in past work. Our research should thus prove useful to those interested in the economics of academic markets.

## References

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<sup>7</sup> This observation is consistent with the conjecture that it has become more difficult to publish in top journals over time. This seems to be a reasonable view. Ellison (2002), for example, shows an increase in the number of articles submitted to top journals.

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**Table 1.** Variation in Alphabetical Listings Across Disciplines (No. of Authors = 2)

Journal	Alphabetical Listings (%)
Economics journals (1978–1997)	
<i>Journal of Political Economy</i>	89.6
<i>American Economic Review</i>	90.2
<i>Quarterly Journal of Economics</i>	89.8
Journals in other disciplines (1978–1997)	
<i>Journal of Finance</i>	85.4
<i>Journal of Economic History</i>	83.8
<i>Yale Law Journal</i>	83.6
<i>American Journal of Sociology</i>	49.4
<i>American Psychologist</i>	53.3
<i>Angewandte Chemie</i>	64.3
<i>New England Journal of Medicine</i>	48.0

Source: Reproduced from Engers et al. (1999).

the physical sciences (chemistry and medicine) employ alphabetical listings at a rate that is closer to 50%. In addition, fields like sociology and psychology also employ alphabetical listings at a rate that is closer to 50%.

Consider next the comparison *within* a given discipline. With data that we collected for the period 1998–2000, Table 2 reports the rate of alphabetization for top tier and second tier economics journals. The top tier journals include *JPE*, *AER*, and *QJE*, while the second tier journals include *Atlantic Economic Journal (AEJ)*, *Economic Inquiry (EI)*, and *Southern Economic Journal (SEJ)*. On the whole, there is a slight increase in the rate of alphabetization in the top tier journals from the earlier period of 1978–1997. More strikingly, we notice that the top tier journals have a markedly *higher* rate of alphabetization than the second tier journals (92.6% vs. 78.3%,  $z = 3.82$ ,  $p < 0.01$ ). This difference within the same discipline is indeed surprising. Similarly, in a recent paper, Laband and Tollison (2002) report that the rate of alphabetization varies dramatically between two closely related disciplines—economics and agricultural economics. Analyzing data for both the *American Economic Review (AER)* and *American Journal of Agricultural Economics (AJAE)*, they find that the majority of *AER* articles are listed alphabetically. In contrast, alphabetical and nonalphabetical papers are almost evenly divided at the *AJAE*. Further, the rate of alphabetization at *AER* has shown an increasing trend

**Table 2.** Variation in Alphabetical Listings within Economics (No. of Authors = 2)

Journal	Alphabetical Listings (%)
Top tier (1998–2000)	
<i>Journal of Political Economy</i>	88.9
<i>American Economic Review</i>	92.3
<i>Quarterly Journal of Economics</i>	96.7
Group mean	92.6
Second tier (1998–2000)	
<i>Atlantic Economic Journal</i>	71.4
<i>Economic Inquiry</i>	74.0
<i>Southern Economic Journal</i>	85.0
Group mean	78.3

Difference between top tier and second tier is statistically significant ( $z = 3.82$ ,  $p < 0.01$ ).

over the period 1981–1996, whereas the rate of alphabetization at *AJAE* has remained relatively flat. They find these differences to be particularly surprising since the training and methodologies employed by both types of scholars—economists and agricultural economists—are very similar.

Before we investigate the mechanism underlying this heterogeneity, it is natural to ask: Do authors care about author ordering? Casual observation and anecdotal evidence suggests that they do. For example, in the medical field, Riesenbergs and Lundberg (1990, p. 1857) report that “some landmark studies are known by the name of their first author, lending support to the impression that, by being listed first, he or she played a pivotal role in performing the work and writing the article.” Riesenbergs and Lundberg further write that obtaining “first-listed author versus, say, sixth on a major article can carry substantial weight in the attainment of those academic rewards to which investigators rightly aspire.”

If authors do care about author orderings, then systematic departures from a 50% rate of alphabetization within two-author teams are a real puzzle. In other words, collaborators striving for priority will lead to a situation in which alphabetical listings and nonalphabetical listings coexist with equal frequency. Thus, we ask (i) What is the underlying mechanism that determines the allocation of intellectual property rights in academic markets? (ii) Can the observed heterogeneity in listing practices be explained by generally accepted differences across academic markets? (iii) Will research quality increase if journal owners mandate that author listings reflect relative contributions, and (iv) What is to be made, say, of an increasing trend in alphabetization at a given journal? Clearly, the answer to the former two questions is of great theoretical interest to scholars of economics. In addition, the answer to the latter two questions might help enhance the functioning of various organizations that are intimately associated with the knowledge production process (e.g., journal boards, professional societies, etc.).

Others have attempted to explain the mechanism underlying author listings. However, these explanations are not without limitations. Engers et al. (1999), for example, employ a game-theoretic framework and suggest that alphabetical listings in economics arise as a result of a signaling equilibrium between authors and the market. While this helps explain the high incidence of alphabetized listings in economics, it cannot explain the lack of alphabetization in related disciplines such as agricultural economics. It also fails to explain the lower levels of alphabetization found in other disciplines. In addition, Engers et al. derive the result that if coauthors are compelled to use a nonalphabetized or priority listing of contributions, the quality of research will go up. In effect, with nonequal property rights assignment, authors will supply more effort to have higher priority, resulting in higher quality research output. However, in a recent paper, Laband and Tollison (2002) find that the quality of published papers, as measured by the number of citations over a five-year period, actually increases with alphabetization. This finding thus “contradicts” the prescription emerging from the theoretical work of Engers et al. As such, it calls for a different mechanism to represent the assignment of intellectual property rights in academic markets.

Laband and Tollison (2000) provide a somewhat different explanation for the lexicographic norm prevalent in economics journals. They suggest that the field of economics is characterized by a relatively high degree of intellectual collaboration. As such, alphabetized listings serve as a form of pay compression and facilitate the collaborative process. Indeed, this is the argument made for pay compression in industrial settings (Lazear 1989). However, this argument also is subject to limitations. While it is easy to understand how pay compression can facilitate cooperation in an industrial setting where enterprise-wide cooperation may be beneficial, it is less clear how pay compression can facilitate cooperation in the production of academic research. In contrast to the zero-sum nature of industrial settings, the production of academic research has more of a positive-sum flavor. That is, in the presence of steep pay differences, a manager may obtain personal benefit if his (or her) second-rate

project succeeds over the first-rate project of a competitive manager. In contrast, every author is better off by creating research, even with a second-author attribution, than not creating research at all. Thus, in these settings, the motivation for sabotage is much reduced.

Given these limitations, we extend the literature by developing an alternative view of the manner in which intellectual property rights are assigned in academic markets. Our conceptualization is stochastic in nature, and we focus on two-author teams. We believe that authors do indeed care about how intellectual property rights are assigned. As such, each individual within the team supplies a high level of effort to obtain priority in author listings. However, research is a creative process in that realized contributions are drawn randomly from a distribution (uniform). The rule for author assignments involves comparing the realized contributions, with a small tolerance level to incorporate bargaining costs. We then employ simulations to compute the rate of alphabetization as a function of the stringency with which papers are accepted for publication. We also examine differences in quality between alphabetical and nonalphabetical papers that have cleared the publication hurdle.

Our stochastic conceptualization is consistent with two empirical regularities associated with author orderings. We find that the rate of alphabetization *increases* in the publication hurdle. And, conditional on clearing the publication hurdle, quality *increases* with alphabetization. The ability of our stochastic model to predict these empirical regularities gives us confidence regarding its ability to capture the underlying mechanism behind the assignment process. As such, they support our view that the production of research is inherently a creative process. Moreover, it suggests that intradisciplinary and interdisciplinary differences can potentially be accounted for by differences in the publication hurdle.

This view of the assignment of intellectual property rights has two important policy implications. First, despite heterogeneity in listing practices, authors uniformly strive to achieve priority in author listings. As such, mandating that authors list by relative contributions is unlikely to enhance the quality of research. Further, an increasing trend in alphabetization, as seen in economics journals, is a sign of a more stringent review process. Thus, contrary to intuition, journal owners should be pleased with greater rates of alphabetization over time. Conversely, all else equal, journal owners should be concerned when they observe a decrease in the rate of alphabetization over time.

The rest of the paper is organized as follows. We first briefly review the literature. We then describe our model and our simulation approach. Next, we present the findings from our simulation runs. Finally, we conclude by outlining the implications of our research.

## **2. Literature Review**

We begin by describing the work of Engers et al. (1999). As mentioned previously, their objective is to provide a theoretical explanation for the widespread use of alphabetical name orderings in economics. They construct a model that resolves the tension between the apparent convention of lexicographic ordering and the interests of authors in sending a more informative signal. They model bargaining as taking place after coauthors have full information regarding their relative contributions toward the overall quality of the paper.

Engers et al. point out that author listings are imperfect indicators of research input in that they have an asymmetric property. A nonalphabetical name order sends a clear signal to the market that the author who is listed first has actually contributed more and should receive a greater proportion of the credit. On the other hand, conforming to the lexicographic ordering sends a mixed signal to the market that places some weight on the possibility that the first author in that instance might have actually contributed more. As a result, reversals harm authors whose name is earlier in the alphabet more than

these authors would benefit from the lexicographic ordering. These asymmetric inferences cause authors to be hesitant about violating the lexicographic norm. In such an environment, Engers et al. analytically demonstrate that the lexicographic norm emerges as an equilibrium solution.

Engers et al. also show that if coauthors are compelled to use a nonalphabetized (or priority) listing of contributions, the quality of research will go up. In effect, with nonequal property rights assignment, authors will supply more effort to have higher priority, resulting in higher quality research output. However, Laband and Tollison (2002) analyze research published at *AER* and *AJAE* and provide empirical evidence that contradicts this prescription. Using citations as a proxy for quality, they find that alphabetized papers are *more* highly cited than nonalphabetized papers. Specifically, in the five years following publication, alphabetized articles in *AER* are cited 50.16 times, while nonalphabetized articles are cited 30.38 times.<sup>1</sup> At the sample means of their data, alphabetized articles are cited 65% more than nonalphabetized articles. Similarly, in the five years following publication, alphabetized articles in *AJAE* are cited 14.7% more than nonalphabetized papers. These findings are thus at variance with the prescription emerging from the work of Engers et al.

In an earlier contribution, Laband and Tollison (2000) provide an alternative explanation for the high degree of alphabetization in economics. This explanation rests on the nature of intellectual collaboration across disciplines. Inquiry in the natural sciences concerns populations of flora, fauna, and physical entities; consequently, it is relatively cheap to verify scientific contributions by performing replication studies and sensitivity analysis after publication of the original findings. This also implies a presumption in favor of publication—the role of the review process is limited to one of ensuring that authors make no egregious errors with respect to method. In contrast to trees, minerals, gases, and animals, human behavior exhibits an enormous degree of heterogeneity from one member of the population to another. Consequently, verification of proposed claims of knowledge made in disciplines that focus on humans through replication studies and sensitivity analysis is relatively costly. As such, verification of scientific truth in economics is likely to occur through greater collaboration between the entities responsible for its creation (authors, colleagues, reviewers, and editors) and the attendant condition of high rejection rates.

In their empirical work, Laband and Tollison (2000) find that their proxy for informal collaboration (the sum of the number of individuals thanked in the title footnote, each workshop or seminar presentation, and each anonymous reviewer or journal editor thanked in the title footnote) approaches 15 for papers published in economics, whereas it is only 6 for papers published in biology. They then suggest that the convention of lexicographic ordering in economics serves as a form of pay compression within the research team. This pay compression, in turn, facilitates the collaborative process.

While this argument has merit in industrial settings (Lazear 1989; Garvey and Swan 1992), we believe it is less relevant in academic contexts. Managers often achieve success in their projects through the cooperation of other (competing) managers. As such, steep differences in pay may limit the amount of cooperation for a high-quality project just because it is championed by a competitor. Because of this dynamic, pay compression may actually yield greater firm output in a world where managers competitively pursue different projects, albeit with some interdependencies. However, the argument does not readily transfer to the academic setting where two authors are working on the same project. It hardly makes sense to limit support for the very project that one is working on.

Clearly, the extant explanations for the widespread use of the lexicographic convention in economics are not without limitations. Neither do we have a theory that can help explain the

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<sup>1</sup> Of course, in their empirical specification, Laband and Tollison (2000) take care to control for size of the research team. They find that the size of the research team positively impacts the number of citations garnered by the research output.

heterogeneity found in author orderings both across and within disciplines. Finally, the empirical observation that research quality increases with alphabetization is also without explanation. All of this motivates us to develop a stochastic model to characterize the allocation of intellectual property rights in academic markets.

### 3. Model and Simulation

The key elements of our model are as follows. We view the research process as an association between two individuals,  $A$  and  $B$ .<sup>2</sup> We use the obvious notation that author  $A$  precedes author  $B$  under a lexicographic ordering. In addition, we assume that research is a creative process in that author  $A$ 's contribution to overall quality,  $qA$ , is drawn from the uniform distribution  $[0,1]$ . Author  $B$ 's contribution,  $qB$ , is similarly defined.<sup>3</sup> In our model, the choice of the uniform distribution ensures that one author cannot provide the requisite quality and thereby forces collaboration.

The total quality of the work,  $Q$ , is given by  $qA + qB$ , and the output is accepted for publication only if  $Q$  exceeds a certain quality hurdle,  $h$ . Finally, as in Engers et al., we assume that authors are interested in sending a signal to the market about their relative contributions. Their decision rule, announced prior to the start of the project, is as follows. The ordering is  $[A, B]$  if  $qA + \delta \geq qB$ , else it is  $[B, A]$ . We call  $\delta$  as the tolerance parameter. That is, author  $B$  is willing to tolerate an  $[A, B]$  ordering as long as  $A$ 's contribution is not lower by the amount  $\delta$ . This tolerance may arise due to bargaining costs or the psychological costs associated with discussing a sensitive topic.

At first blush, it appears that individual contributions to effort are independent of ordering rule. We hasten to point out that this is not the case. If a team member shirks, it is straightforward to incorporate another layer to the model wherein the realized contribution comes from an interval that is inferior to the interval  $[0, 1]$ . This increases the likelihood that this member will lose priority in the final author assignments. Since both authors work under this rule, the resultant solution to this incentive scheme is that both members of the team will supply a high level of effort. This is the well-known "racing" result in economics. In our context, it ensures that realized contributions come from the same interval, namely,  $[0, 1]$ . Of course, author  $A$  is shielded somewhat by the tolerance parameter,  $\delta$ , and may choose to supply a somewhat lower level of effort. Nevertheless, the important observation about this structure is that it predicts equal, or nearly equal, proportions of alphabetized and nonalphabetized papers. In other words, the model thus described does not provide any rationale for the observed heterogeneity in the rates of alphabetization.<sup>4</sup>

To complete our model, we posit that the hurdle,  $h$ , varies across disciplines. This is consistent with the widely accepted notion that publication probabilities differ considerably across academic

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<sup>2</sup> In our investigation, we restrict our attention to research teams with two authors since larger teams may systematically undertake projects with greater complexity.

<sup>3</sup> Of course, research teams may also be formed in which authors vary in ability. However, this should not systematically shift the rate of alphabetization away from 50%. Teams where author  $A$  brings more to the table will, on average, be equal in number to teams where author  $B$  brings more to the table. This will hold regardless of the underlying distribution of names across the alphabet.

<sup>4</sup> For convenience, our analysis is limited to two authors. In principle, however, a more general analysis could be developed that works with  $N$  authors. In the single author case, quality could not exceed 1. Holding other features of our model constant, author quantity and journal quality hurdles would approach infinity, which seems unrealistic, since we do not observe large team sizes. More plausibly, however, the contribution interval would decrease with the number of authors, while coordination costs surely increase with the number of authors. Finally, as the number of authors rises, the tolerance rule for alphabetizing would become more complex. We appreciate the helpful comments and insight of the reviewer who brought this to our attention.



**Table 3.** Simulation Results across Different Publication Hurdles ( $N = 10,000$  for Each Hurdle)

	$h = 1$	$h = 1.1$	$h = 1.2$	$h = 1.3$	$h = 1.4$	$h = 1.5$	$h = 1.6$	$h = 1.7$
Proportion accepted (%)	50.39	40.73	32.33	24.74	18.04	12.58	8.18	4.60
Among accepted								
Proportion alphabetical (%)	59.87	61.18	61.86	64.07	66.46	70.27	73.96	80.43
Proportion nonalphabetical (%)	40.13	38.82	38.14	35.93	33.54	29.73	26.04	19.57
Proportion alphabetical base (%)	18.18	20.35	22.24	25.63	29.66	35.06	42.42	55.65
Proportion alphabetical A-earned (%)	41.69	40.83	39.62	38.44	36.81	35.21	31.54	24.78
Quality alphabetical (mean)	1.36	1.42	1.49	1.56	1.62	1.68	1.75	1.81
Quality nonalphabetical (mean)	1.30	1.36	1.43	1.49	1.56	1.63	1.70	1.77
Correlation (quality, alphabetical)	0.13*	0.14*	0.17*	0.18*	0.19*	0.19*	0.22*	0.24*

\* Significant at the 1% level.

disciplines. Specifically, publication probabilities are higher in biology (and the natural sciences generally) than in economics (and the social sciences generally), as noted by Zuckerman and Merton (1973).

To implement our model, we employ Monte Carlo simulations to examine the nature of author attributions that emerge as a function of the publication hurdle. For each hurdle, we consider 10,000 research collaborations. In each collaboration, the quality contributed by author *A* is drawn from the uniform distribution [0, 1]. Author *B*'s contribution is obtained in the same fashion. Total quality of the work is simply the sum of the two realized qualities. We then use the hurdle rule to compute the acceptance rate. Next, we use the assignment rule to compute the proportion of accepted papers that are listed alphabetically. Among the accepted papers that are listed alphabetically, we further distinguish between those cases wherein the quality difference is within the tolerance parameter and those cases wherein author *A* actually earned first-authorship by exceeding the tolerance parameter. We call these alphabetical base and alphabetical *A*-earned, respectively. We set  $\delta = 0.10$  and consider hurdles that vary from 1.0 to 1.7. Across these hurdles, the total acceptance rate varies from 50% to 5%; this, we believe, is sufficient to capture the diversity in acceptance rates across the disciplines that we consider.

We next present key findings from our simulation runs.

#### 4. Findings

Our findings are displayed in Table 3 and displayed pictorially in Figures 1 and 2. As expected, our simulation runs reveal that increases in the hurdle decrease the fraction of papers that are accepted. Our substantive findings are twofold:

- (i) Among the accepted papers, the proportion of alphabetical papers increases in a convex fashion with the hurdle. In effect, alphabetization increases with the hurdle. Moreover, this increase is decomposed into two components, one of which is increasing in the hurdle rate while the other is decreasing in the hurdle. Specifically, as the hurdle increases, the proportion of alphabetical listings that arise because the relative contributions are within the tolerance band, alphabetical base, increases. In contrast, the proportion of alphabetical listings that arise because author *A*'s contribution earns him (or her) the first position, alphabetical *A*-earned, actually decreases. The net effect, however, is an increase in alphabetization with the hurdle.

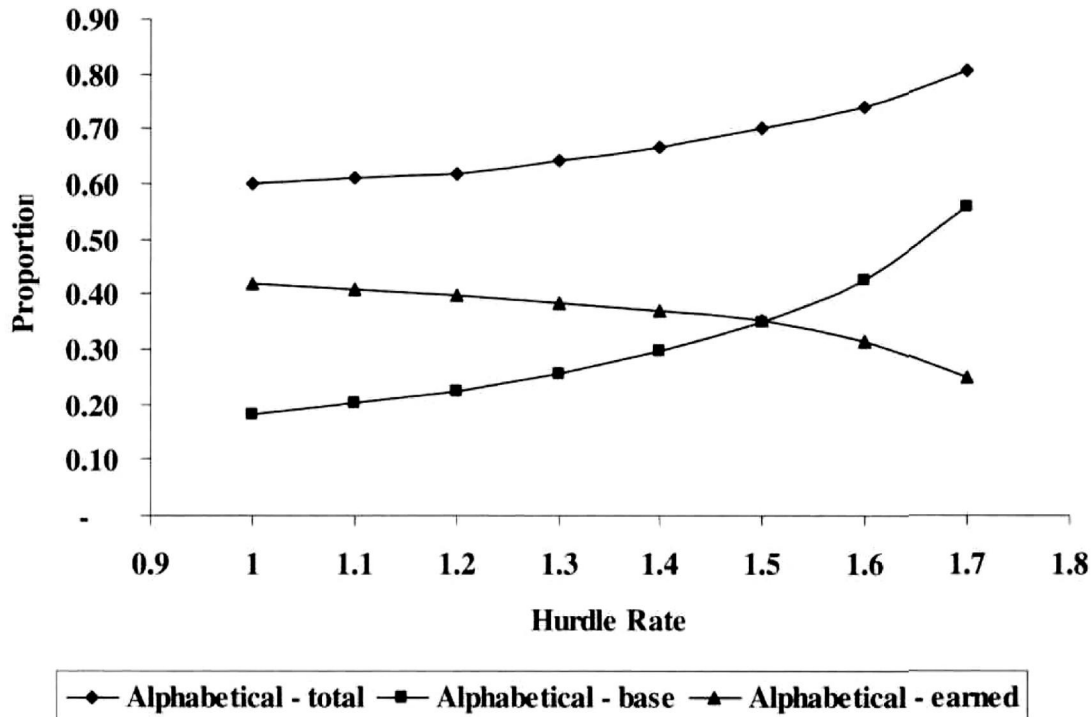


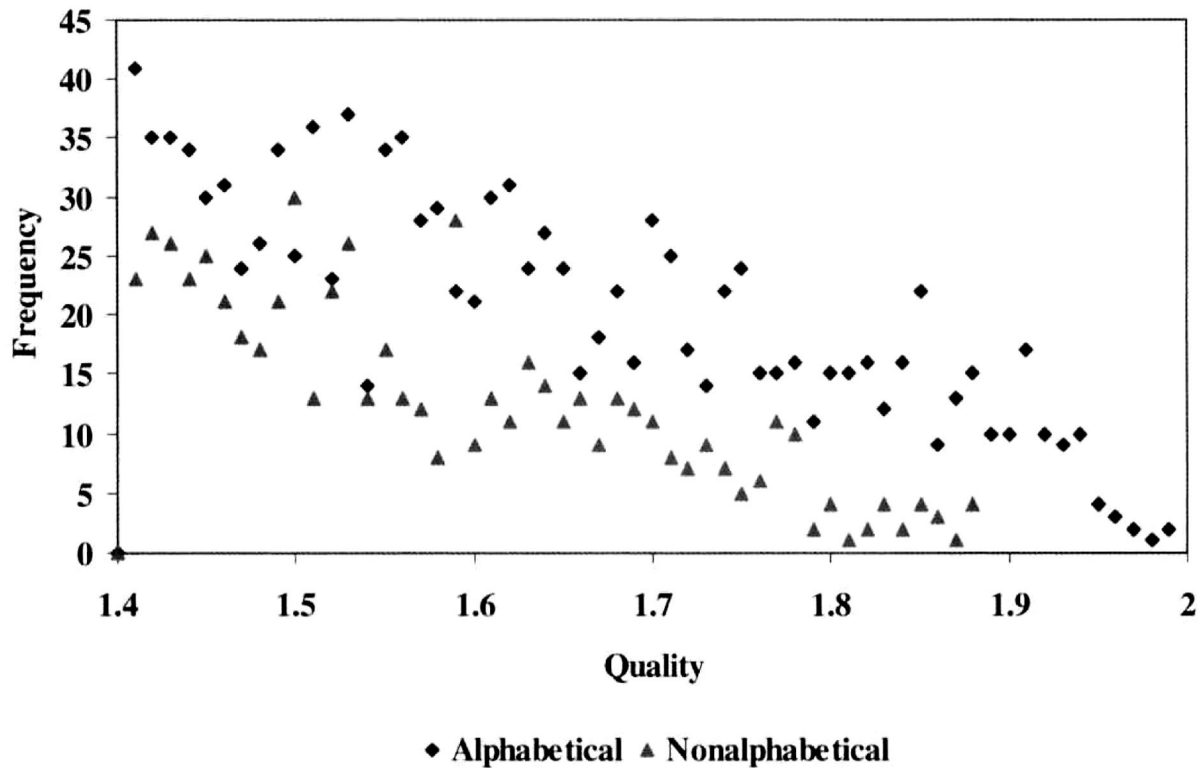
Figure 1. Alphabetization versus Hurdle

(ii) For a given hurdle, the quality of accepted papers is positively correlated with alphabetization. We also find that among the accepted papers, the quality of alphabetized papers is higher than the quality of the nonalphabetized papers. Across the various cases, the correlations vary from about 0.19 to 0.25. These correlations are all significant at the 0.01 level.

The basic intuition behind our first finding is as follows. As the hurdle increases, the most likely way in which the quality standard can be met is by both authors contributing a high level. If both authors contribute a high level, the probability that author *B*'s contribution will exceed author *A*'s contribution by the tolerance factor goes down. The reverse is also true—the probability that author *A*'s contribution will exceed author *B*'s contribution by the tolerance factor also goes down. In either case, the final outcome is a lexicographic ordering of the type alphabetical base. Thus, increases in the hurdle rate make alphabetization more likely with the increase in alphabetization being driven primarily by the increase in alphabetical base.

The intuition for the second finding is similar. For any given hurdle rate, both the accepted nonalphabetized papers and the accepted alphabetized papers form a distribution of qualities. However, the distribution for the alphabetized papers has more mass at higher levels of quality because the likelihood of achieving a high quality level is greater with both authors contributing roughly equal amounts than with author *B* contributing a substantially higher level of quality. Consequently, we obtain a positive correlation between quality and alphabetization. To illustrate this point, we plot the quality histogram for the accepted alphabetized papers as well as the nonalphabetized papers for  $h = 1.4$  in Figure 2. We see that conditional on clearing the hurdle, the quality distribution for the alphabetized papers has more mass at higher quality levels.

Overall, our stochastic conceptualization of author orderings explains two important regularities associated with author orderings. First, our model correctly predicts alphabetization as a function of the publication hurdle across academic disciplines. Specifically, it explains why alphabetization is more pronounced in economics with its low rates of acceptance than in the physical sciences



**Figure 2.** Quality Distribution of Accepted Papers: Alphabetical and Nonalphabetical ( $h = 1.4$ )

(chemistry, medicine) with its relatively higher acceptance rates. In the same vein, this finding also explains differences in the rates of alphabetization between top tier journals and second tier journals in economics. Notice that it is also possible that authors of publications in top tier journals may bargain more vigorously for first placement. However, our intuition suggests that this dynamic will actually *lower* the rate of alphabetization at top journals as authors provide more informative signals.<sup>5</sup> As such, differences in the intensity of bargaining cannot account for the observed findings.

By extension, we also speculate that this finding can help explain the different rates of alphabetization found between top tier and second tier journals (Table 2) and between mainline journals and specialty journals within the same field. The publication hurdle is higher in top tier (general interest) journals than second tier (specialty) journals. The fact that alphabetization increases in a convex fashion with the publication hurdle suggests that even small differences in acceptance rates between the mainline journals and specialty journals can lead to large differences in alphabetization rates.<sup>6</sup>

Second, our model also predicts the Laband and Tollison (2002) finding that alphabetization will be positively correlated with quality. Clearly, this is a prediction that is not so obvious and highlights the value of our simulation exercise. The ability of our model to predict these empirical regularities allows us to conclude that our model captures the mechanisms underlying the assignment of author orderings.

<sup>5</sup> We confirm this intuition via simulations. Specifically, we decrease  $\delta$  to mimic more intense bargaining and find that alphabetization also decreases. (Setting  $\delta = 0.05$  yields alphabetization rates of 55%, 58%, and 67% for  $h = 1, 1.3,$  and  $1.7,$  respectively. These are all lower than the corresponding rates of alphabetization when  $\delta = 0.1$  as reported in Table 3.)

<sup>6</sup> A similar pattern of findings can be observed in a business discipline, namely, marketing. In a study examining publications within the marketing field, Tellis, Chandy, and Ackerman (1999) report that the *Journal of Consumer Research (JCR)* and the *Journal of Marketing Research (JMR)*, along with two other journals, represent the top journals in the field. However, they find the JCR to be the least diverse (most specialized) of the major marketing journals, with an emphasis on psychology-based research on consumer behavior, whereas JMR has evolved to become the broadest publication in marketing. Examining publications in these two outlets for the period 1996–2000, we find that JCR has an alphabetization rate of 62.5%, whereas JMR has an alphabetization rate of 73%. This difference is statistically significant ( $z = 1.37, p < 0.10$ ).