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A Matching Model of the Academic Publication Market

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ABSTRACT:

Given the myriad of journal titles in economics and business administration, scholars can sometimes target the wrong journal. This paper provides a dynamic analysis of the market for academic publications that brings into the picture this type of informational friction. The key modelling device is a paper-to-journal matching function, similar to the matching function traditional in labor economics. An equilibrium is defined as a situation where both editors and authors implement their optimal publication strategies. The model is then solved for the equilibrium submission fee, desk rejection rate and ratio between the number of editors and the number of authors.

Key-Words:

- Academic Journals
- Editors
- Imperfect Information
- Matching

RESUME :

L'article propose un modèle d'appariement pour étudier le fonctionnement du marché des publications académiques. Il permet d'analyser le phénomène de "desk-rejection" et propose une explication pour la montée en puissance de droits de soumission d'articles.

Mots-clés :

- Appariement
- Editeurs
- Information imparfaite
- Revues académiques

JEL classification : C78, A14

A MATCHING MODEL
OF THE ACADEMIC PUBLICATION MARKET
Damien Besancenot*, Kim Huynh[†], Radu Vranceanu[‡]

Abstract

Given the myriad of journal titles in economics and business administration, scholars can sometimes target the wrong journal. This paper provides a dynamic analysis of the market for academic publications that brings into the picture this type of informational friction. The key modelling device is a paper-to-journal matching function, similar to the matching function traditional in labor economics. A equilibrium is defined as a situation where both editors and authors implement their optimal publication strategies. The model is then solved for the equilibrium submission fee, desk rejection rate and ratio between the number of editors and the number of authors.

Keywords: Academic journals, Matching, Editors, Desk-rejection, Imperfect information.

JEL Classification: C78, A14.

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1 Introduction

The publication market can be defined as the place where scholars supply and editors demand academic papers. An important characteristic of this market is the huge flows of papers written, submitted, revised and rejected every year, ultimately leading to a relatively small number of papers published. In the last twenty years, driven by a stronger institutional race for top research positions in the now ubiquitous rankings, the number of scholars committed to research and the number of submitted papers have increased dramatically (Bence and Oppenheim, 2004; Frey, 2009). For instance, the Editor Report 2010 of the *American Economic Review* states that the number of submissions to the journal has increased from 641 in 1980 to 1398 in 2009 (for a stable number of published papers).¹

In turn, this change in volumes brought about several significant changes in the organization of the publication market: firstly, the number of journal titles has also increased, but at a smaller pace than the number of submitted papers, leading to higher congestion. Secondly, while twenty years ago almost no economic journal charged submission fees, these days submission fees are almost generalized; they vary from modest amounts to quite substantial ones (some journals require now submission fees as high as 250 \$). Some authors have pointed out that editors would resort to submission fees only to deter authors of low quality papers from submitting their work to their journal (Leslie, 2005; Azar, 2006).² Thirdly, more and more journals are implementing "desk-rejection procedures", according to which the editor can decide to turn down a paper without sending it to referees, if he considers that the paper does not fit to the aim and scope of the journal (or that the paper is really poorly written). The standard rationale is clearly stated in the Editor Report 2010 of the *American Economic Review*:

Beginning in January 2006, the Editor and Coeditors have reserved the right to

¹ The American Economic Review, *Report of the Editor*, January 2, 2010. See: www.aeaweb.org/aer/index.php.

² Wang (1997) analyzes in a similar way application fees in the labor market.

return manuscripts to authors without referee review. The decision to return a manuscript without review is based upon a number of considerations, including expected probability of meeting the standards of the Review, breadth of topic, interest to the AER audience, and other factors.³

Our paper analyzes the publication market in a dynamic model with trade frictions that explicitly brings into the picture submission fees and the desk-rejection phenomenon. One key assumption is that academic journals are specialized or have their own philosophy. Therefore, a good quality paper, well suited for one journal, might not match the editorial line of another journal. In a world where the number of journal titles in business and economics counts in hundreds, authors might target the wrong journal. If a paper does not match the editorial line of journal, it will be desk-rejected; in the opposite case, it will be sent to referees for an assessment of its quality. The traditional refereeing process is then represented in a simplified way, by considering a fixed probability of having a paper accepted for publication. Hence, in this paper we focus on "horizontal" differentiation between identically demanding journals. The quality of the papers is not explicitly brought into the picture; the only assumption we made is that authors of a referee-rejected paper realize that its quality is too low for the going standards and will not send it to another journal.⁴ To the contrary, the author of a desk-rejected paper will submit it to another journal, hoping for a better fit.

As an original contribution, we introduce at the editor pre-screening level a matching function that connects the number of successful matches to the total number of submitted papers and the number of journal titles. For sure, in a market with horizontally differentiated journals, the more papers each journal gets, the larger the number of papers fitted for that journal; the larger the number of journals, the deeper their specialization (Frey et al., 2009), thus the better are chances

³ See for similar policies the Instruction to Authors web page of *Econometrica*, *Journal of Monetary Economics* or the *Scandinavian Journal of Economics*.

⁴ The structure of the problem would not change if we assume that the author submits a referee-rejected paper to a finite number of journals before withdrawing it, but calculations would be more cumbersome.

for an author to target the right journal.⁵ Our approach builds on the classical literature in labor economics. In this field, the matching function between firms and job-seekers, pioneered by Pissarides (2000), connects the number of successful matches to the number of unemployed persons and vacant jobs.⁶ A journal in the academic publication market is thus similar to a "large firm" in the labor market framework, given that every journal publishes several papers every period. Thus, the paper-to-journal matching function can be seen as a useful "macroeconomic" device, able to describe in a simple way the informational frictions between authors and editors.

An equilibrium of this model is defined as a situation where both scholars and editors implement their optimal plans, given the existing matching process and the socially determined rent-sharing rule. The model has three key endogenous variables: the desk-rejection rate, the tension in the publication market, defined as the ratio between the number of editors (journals) and the number of authors (papers), and the submission fee. We show that the model presents a single equilibrium. Comparative statics with parameters of the model can account for some of the recent trends in the academic publication market. For instance, an increase in the scholars' intertemporal utility from a published paper would lead to an increase in submission fees, in the number of submitted papers and in the desk rejection rate.

While analyses of the academic publication market belong now to a well established field of research, there are not many theoretical analyses that take into account informational frictions specific to this market. As a related work, we can refer to Besancenot et al. (2009) who worked out an equilibrium search model, where authors submit papers and editors search for papers. Editors can be either highly demanding, thus accepting only top papers with a small probability, or tolerant, accepting all papers. In equilibrium, authors optimally decide whether to write high or low quality papers. Lee (2009) argues that matching frictions are a key feature of the publication

⁵ This argument has been put forward by Stigler et al. (1995) in a different set-up. Taking the perspective of scholars searching for new ideas, they argue that the normal reaction of congestion in publication market is journal specialization; this process should reduce the readers' effort for identifying the relevant journals.

⁶ The substantial contribution of Dale Mortensen to this literature should also be acknowledged here (Mortensen, 1994; Mortensen and Pissarides, 1994). See also Cahuc and Zylbeberg (2004) for a thorough description of the matching approach to labor markets.

market, enhanced by the rule according to which a paper cannot be submitted to several journals at the same time. He works out a paper allocation model, similar to an equilibrium search model, and analyses the equilibria. The main result is that frictions in the market, leading to higher delays in publication, could support an efficient separating equilibrium where high-quality papers are published by top-tier journals, and lower quality papers are published by second-tier journals. Without providing a formal model, Pujol (2008) also acknowledges that journals are vertically differentiated, and, due to imperfect information, authors can sometimes target a too high quality journal relatively to their work, thus bearing a high risk of referee-rejection. At difference with these existing studies, in our model journals have identical qualities. This is the price to pay for developing an explicit dynamic analysis of the matching process that is not available elsewhere.

The paper is organized as follows. The next section introduces the main assumption. Section 3 presents the equilibrium and study its main properties. We present our conclusions in the last section.

2 Main assumptions

2.1 Authors, papers and editors

At every period, each author writes one paper, and, following the standard rule in academic publication, he submits it to only one journal. Submissions are uniformly distributed over the existing journals. Each journal is run by one editor. Authors have no perfect information about the editorial line of a journal and can target a wrong journal. Editors must decide whether to have them published or not. The number of editors, denoted by E , is given. The number of authors is denoted by A (with $A \geq E$). We assume that authors can freely enter or exit this market, depending on their outside opportunities. Hence A can vary (and will be endogenously determined).

The paper selection mechanism operates in two steps. In the first step, the editor must decide whether the paper matches the aim and scope of the journal. If the match is not successful, the

editor decides to *desk-reject* the paper. The author will keep on submitting it to other journals until a correct match occurs. If the match is successful, the editor will send it to the referees for an assessment of its quality. A paper sent to referees actually exits the submission process: after the referees deliver their verdict, the paper is either published or withdrawn.

Hence, in the steady state, the total number of papers submitted for publication each period does not vary. It is made up of the newly written papers (in number A) and all the papers written at the previous periods that have not got yet a successful match. Let us denote the steady state number of submissions by N and the probability for a submitted paper to match the editorial line of a journal by $1 - \mu$; the steady state desk-rejection rate is μ . Then, the steady state number of submitted papers per period is related to the number of new papers by a simple relationship:

$$N = A \sum_{k=0}^{\infty} \mu^k = \frac{A}{1 - \mu}. \quad (1)$$

2.2 The matching function

We denote the per-period number of successful matches between authors and editors by M . We assume that M can be written as a twice differentiable function with the general form $M = M(E, N)$, with $\partial M(\cdot)/\partial E = M_E > 0$, and $\partial M(\cdot)/\partial N = M_N > 0$. The rationale behind these properties is easy to grasp: on the one hand, for a given number of journal titles, the more papers are submitted, the more papers per journal and the more of them should fit any of these journals; on the other hand, for a given number of papers, the more journal titles, the greater specialization and the smaller will be chances to target a wrong outlet. Furthermore, this matching function must comply with one important restriction: the number of matches cannot exceed the smallest number between the number of papers: $M(E, N) \leq N$.

In this paper, in order to get an analytical solution, we will assume that the matching function

takes the specific form:⁷

$$M(E, N) = E^\alpha N^{1-\alpha} \text{ with } \alpha \in]0, 1[. \quad (2)$$

The *matching probability* $1 - \mu$ is then:

$$1 - \mu = \frac{M(E, N)}{N} = \left(\frac{E}{N}\right)^\alpha = \left(\frac{E}{A}\right)^\alpha (1 - \mu)^\alpha \quad (3)$$

$$\iff 1 - \mu = \left(\frac{E}{A}\right)^{\frac{\alpha}{1-\alpha}}. \quad (4)$$

Hereafter, formula can be written in a more compact form if we denote by $\theta = E/A$ the "degree of accessibility" of the academic publication market (a higher θ being representative of a an easier path to publication for an author), with $\theta \in]0, 1[$. The matching probability can be written:

$$1 - \mu = \theta^{\frac{\alpha}{1-\alpha}} \quad (5)$$

Another interesting measure is the number of submissions per journal:

$$\frac{N}{E} = \frac{A/E}{1 - \mu} = \frac{1}{\theta(1 - \mu)} = \theta^{-\frac{1}{1-\alpha}} > 1. \quad (6)$$

2.3 The expected intertemporal utility of the scholar, W

As already mentioned, at each time period, the scholar writes one paper and he submits it for publication to only one journal. Because of informational frictions in the publication market, he will meet an editor interested in his work with probability $(1 - \mu)$. When an editor gets a paper well-fitted to his journal, he will proceed to an evaluation of the quality of the text through a standard refereeing process. To keep the model as simple as possible, we consider that there are only two possible outcomes of the refereeing process: the paper can either be *referee-rejected* with the probability $(1 - p)$, or *accepted* with the probability p .⁸ Denoting by β the scholar's discount

⁷ The model could be numerically solved for any function homogenous of degree one $M(\lambda E, \lambda N) = \lambda M(E, N)$, $\forall \lambda$. This property is intuitively appealing: indeed, doubling the number of papers and the number of titles, it is reasonable to assume that the number of matches would double.

⁸ The structure of the model would not change if we consider a two stage evaluation, were we add a revise and resubmit option, followed by accepted or rejected. Formulas would become more cumbersome due to the compounded discount. See for a more powerful analysis of the paper selection process, Enger and Gans (1998), Besancenot and Vranceanu (2008) or Heintzelman and Nocetti (2009).

factor, his intertemporal expected utility prior to sending his paper to a journal is:

$$S = \mu\beta S + (1 - \mu) \{-s + \beta [pW_A + (1 - p)W_R]\}. \quad (7)$$

In this expression, the first term is the expected gain if the match was unsuccessful; in this case, that occurs with probability μ , at the next period the scholar will re-submit his paper to another journal and expect the same reward S .⁹ The second term is the expected payoff if the match is successful (which happens with probability $(1 - \mu)$): the scholar pays the submission fee s and waits for the editor's decision. The latter takes advice from referees, then either rejects the paper, which worth then W_R , or accepts it, which worth then W_A for its author

When a paper is referee-rejected, the author must decide if he will try to find another suitable journal for his article. For the sake of parsimony, we will consider here that after a motivated rejection, the paper is definitively withdrawn from the publishing game by its author. Hence, the expected utility of the author of a referee-rejected paper is: $W_R = 0$.

Many theoretical and empirical analyses have shown that a scholar's pay, promotion and tenure decision depend to a large extent on his publication record (Gomez-Mejia and Balkin, 1992; Swidler and Goldreyer, 1998; Swanson, 2004). Hence, we merely assume that the author gets a positive intertemporal utility from publishing one additional paper: $W_A = u$, with $u > 0$.¹⁰

Then equation (7) can be solved for an explicit value of S :

$$S = \frac{(1 - \mu)(-s + \beta pu)}{1 - \mu\beta}. \quad (8)$$

Denoting the cost of drafting a new paper by c , the *net expected intertemporal value from writing a paper* can be written:

$$\begin{aligned} W &= S - c \\ &= \frac{(1 - \mu)(-s + \beta pu)}{1 - \mu\beta} - c \end{aligned} \quad (9)$$

⁹ Remember that when a paper is desk-rejected, the author will keep on trying to find a suitable journal. He will do so as long as the paper has not been accepted or rejected by a referee.

¹⁰ Here we assume that the utility of every new publication is constant. Paul and Rubin (1984) argue that, for signaling motives, the value of the first publications should be larger than the value of subsequent ones.

We notice that the problem is meaningful only for $W > 0$. The intertemporal utility of the author is a decreasing function in the submission fee s .

2.4 The expected intertemporal utility of the editor, V

At any time period, each editor gets N/E submissions. At the first stage of the selection process, each paper is screened by the editor. Given the matching process defined here-above, M/E papers match the aim and scope of the journal and will be sent to referees; the remaining $(N - M)/E$ papers will be desk rejected. The effort of screening one paper involves a cost g for the editor.

Denoting by V_{DR} the expected utility of a desk rejected paper, and by V_S the expected utility of a paper sent to the referees, the expected intertemporal payoff of the editor (from being in the publication market) can be written as:

$$V = -g\frac{N}{E} + \frac{M}{E}V_S + \frac{N - M}{E}V_{DR}. \quad (10)$$

The value of a desk-rejected paper is elementary $V_{DR} = 0$. When the editor decides to send the paper to referees, he will charge the author a submission fee $s > 0$. At the next period, he will pay the referees an amount $r \geq 0$ and, according to the referees' reports, he will either accept the paper (and get the reward V_A) or reject it (and receive V_R). The expected utility V_S of a paper sent to the referees can be written:

$$V_S = s + \beta [pV_A + (1 - p)V_R - r]. \quad (11)$$

The intertemporal utility of the editor from an accepted paper is $V_A = v$ and the intertemporal utility of the author from a referee-rejected paper is $V_R = 0$. Thus, the expected intertemporal payoff of the editor (Eq.10) becomes:

$$\begin{aligned} V &= -g\frac{N}{E} + \frac{M}{E}V_S \\ &= \frac{N}{E} \left\{ -g + \frac{M}{N} [s + \beta (pv - r)] \right\} \\ &= \frac{N}{E} \{ -g + (1 - \mu) [s + \beta (pv - r)] \}. \end{aligned} \quad (12)$$

where we recall that $\frac{N}{E} = \theta^{-\frac{1}{1-\alpha}}$ and $(1 - \mu) = \theta^{\frac{\alpha}{1-\alpha}}$. The editor's intertemporal surplus is increasing with s .

3 Main relationships and the equilibrium

3.1 Author free entry condition and the $s = \Phi(\theta)$ relationship

In general, people who can play the publication game are highly trained individuals who can use their human capital for alternative activities. For instance, in many higher education institutions, faculty members, at some stage of their career, choose to teach more hours in executive education programmes or do administrative work. If the reward from academic publication increases, some of them might be tempted to reduce their teaching or administration hours and do more research (Fox and Milbourne, 1999; Taylor et al., 2006). Consulting or nice jobs in public administration or international organizations are also accessible to many well trained scholars (Faria, 2001; 2002)

In our model, these outside opportunities provide the would-be author with a reservation intertemporal utility level, denoted by \bar{W} (with $\bar{W} > 0$). Under free entry, new authors enter the publication market as long as they expect that the intertemporal gain from this activity is larger than \bar{W} , and leave the market in the opposite case. In the steady state equilibrium, the expected intertemporal utility W is driven to \bar{W} . The condition $W = \bar{W}$ allows us to put forward a first relationship between the degree of accessibility, $\theta = E/A$, and the submission fee, s . Given the definition of W (Eq. 9), we can write:

$$\begin{aligned} W &= \bar{W} \\ \Leftrightarrow \frac{(1 - \mu) \{-s + \beta pu\}}{1 - \mu\beta} - c &= \bar{W} \\ \Leftrightarrow s &= \beta pu - (\bar{W} + c) \left[(1 - \beta) \theta^{-\frac{\alpha}{1-\alpha}} + \beta \right]. \end{aligned} \quad (13)$$

Denoting by $\Phi(\theta) = \beta pu - (\bar{W} + c) \left[(1 - \beta) \theta^{-\frac{\alpha}{1-\alpha}} + \beta \right]$, the last equation can be written in the compact form:

$$s = \Phi(\theta). \quad (14)$$

with $\frac{\partial \Phi(\theta)}{\partial \theta} > 0$, $\frac{\partial^2 \Phi(\theta)}{\partial \theta^2} < 0$ and $\lim_{\theta \rightarrow 0} \Phi(\theta) = -\infty$, $\Phi(1) = \beta pu - (\bar{W} + c)$. Given that $W + c = S$ such as defined by Eq. (8), we can check that $\Phi(1) > 0$.

The graph of $\Phi(\theta)$ is plotted in Figure 1:

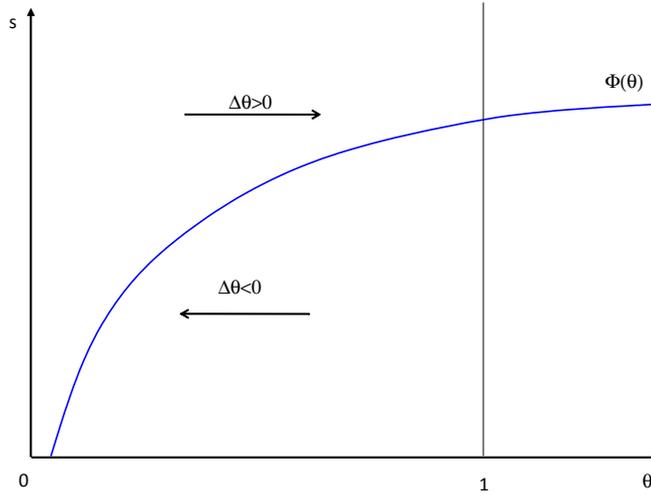


Figure 1: Author free-entry condition

Recall that authors' intertemporal utility W is decreasing with s . All points above the line $s = \Phi(\theta)$ correspond to situations where the intertemporal gain of a scholar is lower than \bar{W} , thus scholars are attracted by non academic activities and exit the publication market. The number of authors decreases and θ increases. In turn, given (5), $(1 - \mu)$ increases and the probability of desk rejection μ declines.

Points below the line correspond to an author's intertemporal utility greater than \bar{W} , thus some new scholars decide to enter the publication market. A increases and $\theta = E/A$ decreases over time.

3.2 The rent sharing rule and the $s = \Psi(\theta)$ relationship

In a normally functioning publication market, the representative author obtains from writing a paper the intertemporal utility W and the representative editor gets from running his journal the intertemporal utility V . With A authors and E editors in the market, the overall welfare Ω

generated by the publication market is given by:

$$EV + AW = \Omega \quad (15)$$

How this total welfare is divided between the two types of players is a matter of social organization of this special market, prevailing institutional arrangements and ultimately the balance of powers between the two groups of players. It is beyond the scope of this paper to provide an in-depth analysis of the surplus sharing mechanism. In the following we merely assume that editors gets a share δ of the total surplus while authors gets a share $(1 - \delta)$. In other words, we have:

$$\begin{aligned} EV &= \delta\Omega \\ AW &= (1 - \delta)\Omega \end{aligned} \quad (16)$$

This surplus sharing rule allows us to write:

$$\frac{EV}{AW} = \frac{\delta}{(1 - \delta)} \iff V = \frac{\delta}{(1 - \delta)} \frac{A}{E} W. \quad (17)$$

Given that $W = \bar{W}$, this last equation implies:

$$\begin{aligned} V &= \frac{\delta}{(1 - \delta)} \frac{A}{E} \bar{W} \\ \iff \frac{N}{E} (-g + (1 - \mu)(s + \beta[pv - r])) &= \frac{\delta}{(1 - \delta)} \frac{A}{E} \bar{W} \\ \iff s &= \frac{\delta}{(1 - \delta)} \bar{W} - \beta[pv - r] + g\theta^{-\frac{\alpha}{1-\alpha}}. \end{aligned} \quad (18)$$

Denoting by $\Psi(\theta) = \frac{\delta}{(1-\delta)}\bar{W} - \beta[pv - r] + g\theta^{-\frac{\alpha}{1-\alpha}}$, the last equation can be written in the compact form:

$$s = \Psi(\theta) \quad (19)$$

with $\frac{\partial \Psi(\theta)}{\partial \theta} < 0$, $\frac{\partial \Psi^2(\theta)}{\partial \theta^2} > 0$, and $\lim_{\theta \rightarrow 0} \Psi(\theta) = +\infty$, $\Psi(1) = \frac{\delta}{(1-\delta)}\bar{W} - \beta[pv - r] + g$.

Figure 2 represents the graph of $\Psi(\theta)$.

Recall that editors' intertemporal utility V is increasing with s . All points below the curve $s = \Psi(\theta)$ represent situations where editors' reward EV is too low relatively to scholars' utility AW ; to restore the balance, the submission fee is expected to rise. All points above the curve

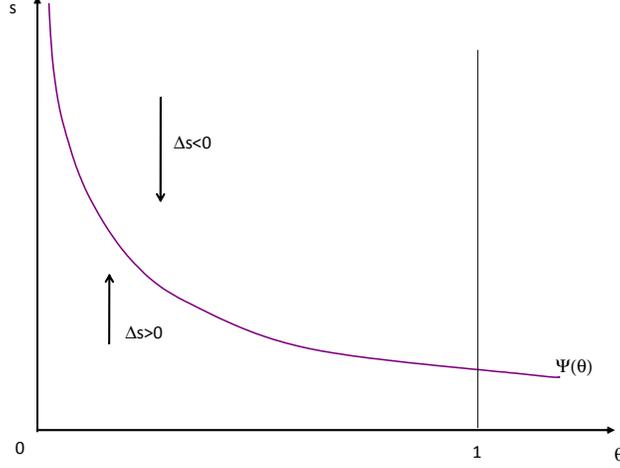


Figure 2: The rent sharing agreement

$s = \Psi(\theta)$ correspond to situations where the submission fee must decline to restore the socially agreed balance of welfare shares.

3.3 The steady state equilibrium

An equilibrium solution is a pair (s, θ) with $s > 0$ and $\theta \in]0, 1[$ that simultaneously fulfills equations $s = \Phi(\theta) > 0$ (the free entry condition, Eq. 14) and $s = \Psi(\theta) > 0$ (the surplus sharing condition, Eq. 19). Such an equilibrium is represented as the point Z in Figure 3.

The equilibrium θ is implicitly defined by $\Psi(\theta) = \Phi(\theta)$. We can obtain its explicit form:

$$\begin{aligned}
 \Psi(\theta) &= \Phi(\theta) \\
 \Leftrightarrow \beta p u - (\bar{W} + c) \left[\beta + (1 - \beta) \theta^{-\frac{\alpha}{1-\alpha}} \right] &= \frac{\delta}{(1-\delta)} \bar{W} - \beta [p v - r] + g \theta^{-\frac{\alpha}{1-\alpha}} \\
 \Leftrightarrow \theta &= \left[\frac{(\bar{W} + c) (1 - \beta) + g}{\beta p (u + v) - \beta (r + c) - \left(\beta + \frac{\delta}{1-\delta} \right) \bar{W}} \right]^{\frac{1-\alpha}{\alpha}}.
 \end{aligned} \tag{20}$$

The equilibrium matching probability results from equation (5):

$$1 - \mu = \theta^{\frac{\alpha}{1-\alpha}} = \frac{(1 - \beta) (\bar{W} + c) + g}{\beta p (u + v) - \beta (r + c) - \left(\beta + \frac{\delta}{1-\delta} \right) \bar{W}}. \tag{21}$$

The number of submissions per journal (Eq. ??) can also be inferred in a straightforward way:

$$\frac{N}{E} = \theta^{-\frac{1}{1-\alpha}} = \left[\frac{\beta p(u+v) - \beta(r+c) - \left(\beta + \frac{\delta}{1-\delta}\right) \bar{W}}{(\bar{W}+c)(1-\beta) + g} \right]^{\frac{1}{\alpha}}. \quad (22)$$

Finally, the equilibrium submission fee is:

$$\begin{aligned} s &= \frac{\delta}{(1-\delta)} \bar{W} - \beta[pv - r] + g\theta^{-\frac{\alpha}{1-\alpha}} \\ \Leftrightarrow s &= \frac{\delta}{(1-\delta)} \bar{W} - \beta[pv - r] + g \frac{\beta p(u+v) - \beta(r+c) - \left(\beta + \frac{\delta}{1-\delta}\right) \bar{W}}{(\bar{W}+c)(1-\beta) + g} \\ \Leftrightarrow s &= \frac{(\bar{W}+c)(1-\beta) \left[\frac{\delta}{1-\delta} \bar{W} - \beta(pv - r) \right] + \beta g(pu - c - \bar{W})}{(\bar{W}+c)(1-\beta) + g}. \end{aligned} \quad (23)$$

A single equilibrium exists under the necessary and sufficient condition:

$$\Psi(1) < \Phi(1) \Leftrightarrow \frac{\delta}{(1-\delta)} \bar{W} - \beta[pv - r] + g < \beta pu - (\bar{W} + c) \quad (24)$$

$$\Leftrightarrow \frac{1}{(1-\delta)} \bar{W} + \beta r + g + c < \beta p(u + v). \quad (25)$$

Chances that this condition is fulfilled are better if direct and opportunity cost of each player are relatively small, or if the utility from publishing a paper for either the author or the editor is large enough.

The implicit dynamics represented by the arrows in Figure 3 show that the model presents a Cobweb structure. A sufficient condition for the equilibrium to be locally stable is that the curve $\Phi()$ to be steeper than $\Psi()$ (oscillations dampen around the equilibrium). It turns out that $[ds/d\theta]_{\Phi} > -[ds/d\theta]_{\Psi} \Leftrightarrow (\bar{W} + c)(1 - \beta) > g$. Chances to have this condition fulfilled are better if the cost of managing papers by the editor is relative low, and if authors direct (c) and indirect opportunity cost (\bar{W}) of writing papers is large.

3.4 Properties of the equilibrium

We can now analyze the impact of changes in the main parameters on the equilibrium values of s and θ . For so doing, we have to take into account the impact of parameter changes on the two curves, $s = \Phi(\theta)$ and $s = \Psi(\theta)$. Table 1 presents the partial derivatives $\partial\Psi(\theta, i)/\partial i$ and

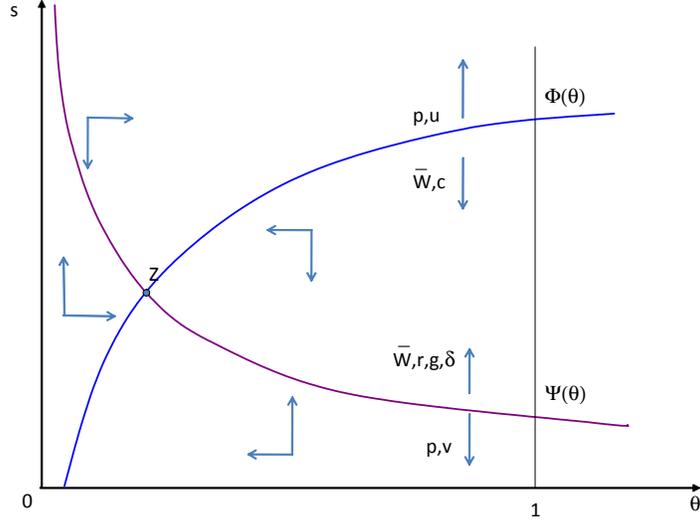


Figure 3: Equilibrium in the academic publication market

$\partial\Phi(\theta, i)/\partial i$, for $i \in \{r, c, p, v, u, g, \bar{W}, \delta\}$. The signs of these derivatives can be inferred without ambiguity:

i	$\partial\Phi(-)/\partial i$	$\partial\Psi(-)/\partial i$
r	0	β
c	$-\left((1-\beta)\theta^{-\frac{\alpha}{1-\alpha}} + \beta\right)$	0
p	βu	$-\beta v$
v	0	$-\beta p$
u	βp	0
g	0	$\theta^{-\frac{\alpha}{1-\alpha}}$
\bar{W}	$-\left((1-\beta)\theta^{-\frac{\alpha}{1-\alpha}} + \beta\right)$	$\frac{\delta}{(1-\delta)}$
δ	0	$\frac{1}{(1-\delta)^2}\bar{W}$

Table 1. Various partial derivatives

We represent in Figure 3 how the two curves move in response to positive variations of the parameters $r, c, p, v, u, g, \bar{W}, \delta, \alpha$ by the respective arrows.

Table 2 indicates the sign of the variation in the equilibrium values of θ and s with respect to variations in parameters such as indicated by comparative statics with the two relationships in Figure 3 (or directly through Eq. 20 and Eq. 23).

	r	c	p	v	u	g	\bar{W}	δ
θ	+	+	-	-	-	+	+	+
s	+	-	?	-	+	+	?	+

Table 2. Impact of parameter change on s and θ

In the last few years, in many regions of the globe (mainly Europe and Asia), governments are implementing reforms aiming at strengthening ties between academics' compensation and their research performance (Groot and Garcia-Valderrama, 2006). In Europe, substantial momentum to the reform of higher education and R&D systems was brought by the Lisbon Summit of 2000, where leaders of the EU member countries acknowledged that lasting growth can be achieved only if the performance in these two areas improves in a substantial way. At the school playing level, the emergence of ubiquitous rankings is setting additional pressure on deans to reward research performance more aggressively. The direct consequence of these policy changes is an increase in scholars' utility from publishing a paper (u). According to our analysis, when the net utility u of the author from publishing a paper increases, their expected intertemporal gain W goes up. New scholars are thus attracted by the publication market and start submitting papers, θ declines. The rise in the number of submissions also presents an adverse effect on the editors' utility as it increases the editors' overall screening cost that is not fully compensated by the increased number of published papers. To restore the agreed shares of surplus, the submission fees must increase in order to offset the relative decline in editors' surplus V . This partially offsets the initial rise in authors' intertemporal gain W . In the steady state, at the term of the adjustment process, the submission fee (s) has increased, the ratio between editors and authors has decreased and, consequently, the number of submissions per journal have increased. These implications of the model are much in line with the observed stylized facts. Indeed, as mentioned in the Introduction,

in the last few years the number of submitted papers has increased dramatically, which prompted editors to implement "defense strategies" such as the systematic recourse to desk-rejection or the introduction of large submission fees.

The model suggests that some factors, such as a lower probability of the referees accepting papers, a higher writing cost or an increased Editors' power might offset the former trends.

For instance, Ellison (2002) argues that over time referees tend to become more demanding. If the probability p of accepting a paper is reduced, both the editors and the scholars can expect a deterioration of their respective surpluses. If some authors leave the publication market, $\theta = E/A$ goes up and the probability of desk rejection declines. At the same time, a smaller number of submissions entails a smaller editorial processing cost. Depending on the relative strength of the two effects (on the one hand, a smaller number of publications per journal pushes down the editor's expected reward, on the other hand, the falling number of submissions brings down the editorial cost), editors would see their surplus raising or not and would adjust submission fees accordingly.

In the same line of reasoning, in order to comply with a tougher publishing norm, authors might have to bear larger writing costs (c). This would also push some authors out of the publication market and help containing the raise in submission fees.

Finally, one could notice that traditionally the publication of academic papers was driven by a concern for serving the academic community. In the early years of the 20th century, most academic journals were published by national and regional associations of scholars. Over time, profit-driven businesses such as the major publishing houses (Elsevier, Springer, Sage, Blackwell, etc.) have gradually increased their participation to the academic publication market. Such institutional change could be responsible for a change in the surplus sharing rule in favour of the editors. If the balance of power between editors and authors changes such as a bigger share of the surplus goes to editors (δ goes up), the submission fee must increase. In turn, since $W < \bar{W}$, some scholars leave the publication market, the ratio $\theta = E/A$ will increase and so does the matching

probability $(1 - \mu)$. Given that it becomes now easier for authors to have their papers published, that evolution partially offsets the initial increase in fees. At the term of the adjustment process, both s and θ would have risen.

4 Conclusion

For many years, the flow of papers submitted for publication in academic journals in business administration and economics has been increasing steadily. The number of journal titles is also growing, but at smaller pace. The resulting journal congestion is at the origin of substantial frustration and criticism on behalf of both authors and editors. In this context, editors are testing new strategies aimed to preserve the quality of their journals and attract the best contributions. Among these new intriguing policies, one can mention the generalization of (large) submission fees, the lengthier response time and the implementation of desk-rejection, defined as the possibility for the editor to decide on his own whether a paper matches or not the aim and scope of the journal.

This paper aimed at providing a dynamic model of the academic publication market where scholars supply and journals demand papers. In our model, due to imperfect information, scholars can sometimes target a wrong journal in terms of editorial line. The key and original modeling device is a paper-to-journal matching function, relating the number of successful matches to the numbers of authors and journals in the market, inspired from the classical matching model in labor economics (Pissarides, 2000). If a paper overcomes this first test, then the editor will send it to referees who ultimately decide whether to publish it or not.

The model presents a single equilibrium, defined as a situation where both editors and authors implement their optimal publishing strategies, given the matching process and the socially determined share of rent between the two groups of players. Parameter changes have in general unambiguous consequences on the main endogenous variables: the ratio between the number of authors and editors, the number of submissions per editor, the desk rejection rate and the submission fee. In the light of our analysis, the recent trends in the market for publication such as

the simultaneous increase in submission fees and number of submissions can be interpreted as a direct consequence of the rise in authors' utility from publishing a paper, itself related to the recent institutional changes in the academic publication market.

Like the elementary version of the labor market matching model, our simple model cannot pretend to provide an exhaustive picture of the academic publication market, but can be seen as a good starting point for more powerful analyses, where the introduction of heterogeneous agents or a more active role for editors in the paper selection process could bring the model closer to reality. However, a dynamic model has its own merit, since it can describe in a more thorough way a market characterized by huge flows of "commodities", such as the market for academic publications. It also provides policymakers with a better understanding of transmission mechanisms, that should not be neglected in when working out any reform of the higher education system.

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