Fear of Rejection?

Tiered Certification and Transparency

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The sub-prime crisis has shown a harsh spotlight on the practices of securities underwriters, which provided too many complex securities that proved to ultimately have little value. This uproar calls attention to the fact that the literature on intermediaries has carefully analyzed their incentives, but that we know little about the broader strategic dimensions of this market. The paper explores three related strategic dimensions of the certification market: the publicity given to applications, the coarseness of rating patterns and the sellers' dynamic certification strategies. In the model, certifiers respond to the sellers' desire to get a chance to be highly rated and to limit the stigma from rejection. We find conditions under which sellers opt for an ambitious certification strategy, in which they apply to a demanding, but non-transparent certifier and lower their ambitions when rejected. We derive the comparative statics with respect to the sellers' initial reputation, the probability of fortuitous disclosure, the sellers' self-knowledge and impatience, and the concentration of the certification industry. We also analyze the possibility that certifiers opt for a quick turnaround time at the expense of a lower accuracy. Finally, we investigate the opportunity of regulating transparency.

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1 Introduction

As most markets are characterized by imperfect knowledge, informational intermediaries have become central to their working. From underwriters to rating agencies, from scientific journals to entry-level examinations, from standard-setting organizations to system integrators, intermediaries serve sellers and buyers by providing product-quality information to the latter.

The literature on intermediaries has carefully analyzed their incentives. By contrast, little do we know about three related strategic dimensions of the certification market: the publicity given to applications, the coarseness of rating patterns, and the sellers' dynamic certification strategies. Policies in these matters exhibit substantial heterogeneity. Regarding the transparency of the application process, scientific journals, certified bond rating agencies, lenders, underwriters, employers, organic food certifiers, or prospective dates usually do not reveal rejected applications. By contrast, entry-level examinations companies (SAT, GMAT,...) disclose previous, and presumably unsuccessful attempts by the student. Regarding the coarseness of grading, many institutions, such as most scientific journals, adopt a "minimum standard" or "pass-fail" strategy, while others, such as entry-level examination firms, report an exact grade. While a fine partition in the grading space presumably requires more resources than a pass-fail approach, what drives the choice of coarseness is unclear.

Table 1 reports the strategies of some certifiers regarding publicity and grading. Note that "application opacity" refers to the certifier's policy, not necessarily to the outcome. For example, one may fortuitously learn that a paper was submitted to and rejected by a journal; furthermore, a delayed publication may create some stigma as the profession is unsure as to whether the delay is due to the author, slow editing or a rejection. Similarly, while academic departments, corporations and partnerships warn in advance assistant professors and junior members that they are unlikely to receive tenure or keep their job, thereby allowing them to attempt to disguise a layoff as a quit, information leakages and the inference drawn from the very act of quitting provide some limit to this strategy.

		Application process is (intentionally)	
		opaque	transparent
Grading strategy	minimum standard	• (most) scientific journals • job market • underwriting	• (many) state medical licensing exams
	fine	• BePress • rating agencies	• entry-level examinations

Table 1

Our lack of understanding of the certification process has been highlighted by the recent efforts to ensure transparency of the securities rating process, particularly in the area of structured finance. On an explicit level, all major rating agencies follow a well-defined process, whose end product is the publication of a rating based on an objective analysis. But firms have been historically able to get rating agencies not to disclose ratings that displease them. First, the U.S. Securities and Exchange Commission (SEC) (2008) notes that even if a firm appeals a rating that displeases it and the appeal is rejected, the proposed rating may not be published. Instead, a "break-up fee" is paid by the issuer to the rating agency to compensate it for its efforts.

Alternatively, as Portnoy (2006) notes, consulting services offered in recent years by rating agencies to issuers may make an apparently transparent process opaque:

> *With respect to ancillary services, credit rating agencies market pre-rating assessments and corporate consulting. For an additional fee, issuers present hypothetical scenarios to the rating agencies to understand how a particular transaction—such as a merger, asset sale, or stock repurchase—might affect their ratings. Although the rating agencies argue that fees from ancillary services are not substantial, there is evidence*

that they are increasing. In addition, with respect to rating agency assessment services, once an agency has indicated what rating it would give an issuer after a corporate transaction, the agency would be subject to pressure to give that rating. For example, if an agency were paid a fee for advice and advised an issuer that a stock repurchase would not affect its rating, it would be more difficult for the agency to change that rating after the issuer completed the repurchase.

This point is also made in a recent congressional testimony by Coffee (2008):

> *The inherent conflict facing the credit rating agency has been aggravated by their recent marketing of advisory and consulting services to their clients. Today, the rating agencies receives one fee to consult with a client, explain its model, and indicate the likely outcome of the rating process; then, it receives a second fee to actually deliver the rating (if the client wishes to go forward once it has learned the likely outcome). The result is that the client can decide not to seek the rating if it learns that it would be less favorable than it desires; the result is a loss of transparency to the market.*

In response to these behaviors, the SEC (2008) proposed on June 11, 2008 that rating agencies dramatically increase their transparency:

> *Require [rating agencies] to make all their ratings and their subsequent rating actions publicly available, to facilitate comparisons of [rating agencies] by making it easier to analyze the performance of the credit ratings the [rating agencies] issue in terms of assessing creditworthiness.*

Somehow, certifiers' policies must reflect the demands of the two sides of the market, as well as who has "gatekeeping power" over the certification process. In the majority of applications, on which we will mainly be focusing here, the seller chooses the certifier. While they need to be credible vis-à-vis the buyers, the certifiers must first cater to the sellers' desires.

As for dynamic certification strategies, sellers most often adopt a top-down submission strategy, in which they apply first to the best certifiers and then, after rejections, move down the pecking order. Why do we observe this pattern, and what determines the rejection rate, or equivalently whether submissions tend to be ambitious or realistic?

To address these questions, we develop a model in which certifiers respond to the sellers' demand for certification. At an abstract level, a certifier's policy maps the information it acquires about the quality of the product into a public signal; and importantly the public signal may be the lack thereof: the certifier can (try to) conceal the existence of an application in order not to convey bad news about quality. By contrast, we allow for fortuitous disclosure, as buyers may hear about the application ("through the grapevine") even if the certifier does not disclose it.

We find conditions under which sellers opt for an ambitious strategy, in which they apply to a demanding, but non-transparent certifier and lower their ambitions when rejected. We derive the comparative statics with respect to the sellers' initial reputation, the probability of fortuitous disclosure, the sellers' self-knowledge and impatience, and the concentration of the certification industry. We also analyze the possibility that certifiers opt for a quick turn-around strategy at the expense of a lower accuracy. Finally, we investigate the opportunity of regulating transparency.

The paper is organized as follows. Sections 2 and 3 lay down the basic model, in which multi-tier grading is costly and only minimum-standard certification is offered. It solves for a competitive or concentrated certifying industry equilibrium and conducts the welfare analysis of transparency regulation. Section 4 analyzes the impact of the sellers' accuracy of information about the quality of their offering. Section 5 generalizes the basic model by endogeneizing the sellers' quality choice. Section 6 examines the effect of entry by certifiers who trade off accuracy and turn-around time. Section 7 allows for multi-tier grading. Section 8 summarizes our insights and discusses a number of open questions.

Relationship to the literature

There is a large literature on certification in corporate finance, industrial organization or labor markets. In corporate finance, among the most cited papers are Booth and Smith (1986), Grinblatt and Hwang (1989) and Weiss (1991). Much of this literature focuses on the trade-off for certified agents between the cost of certification and its benefits in terms of signaling, reduced agency costs or assortative matching. Much less has been written on the industrial organization of the certifying industry. An exception is Lerner-Tirole (2006), in which certifiers differentiate through their composition and decision processes, making them more or less friendly to sponsors' interests. The current paper investigates certifiers' positioning with respect to transparency; it further analyzes sequential rejections, an issue that was shown not to arise in Lerner-Tirole, in which the technology sponsor's objective was simply to have the technology adopted.

Other exceptions are the papers by Morrison and White (2005) and Gill and Sgroi (2003). In particular, banks in Morrison-White apply to regulators with different perceived abilities. A successful application to a tough regulator allows banks to raise more deposits. As regulators make mistakes, banks may get a second chance. On the other hand, the Morrison-White paper focuses on rather different issues than our paper; for instance, it assumes that applications are transparent.

2 The model

Time is discrete and runs from $-\infty$ to $+\infty$. There is a mass 1 of buyers and a steady inflow of sellers, each with one product. For simplicity, the representative seller's quality i is initially unknown to both sides of the market and can take one of three values: high (H), low (L) or "abysmal" ($-\infty$), with respective benefits for the buyers $b_i \in \{b_H, b_L, -\infty\}$ with $b_H > b_L > -\infty$. Conditional on not being abysmal, quality is high with prior probability ρ and low with prior probability $1 - \rho$. Buyers prefer quality H to quality L, and won't consider the product unless its quality has been certified to be at least L. A seller whose quality cannot be certified to be at least L does not bring the product to the market and obtains zero profits.

Assuming that this certification has taken place, let $\widehat{\rho}$ denote the buyers' posterior belief at the time at which the product is brought to the market (more on this shortly). Let $S_i(\widehat{\rho})$ denote the seller's expected gain from putting a product of quality i on the market when beliefs are $\widehat{\rho}$. We will assume that S_i is always positive and is increasing in $\widehat{\rho}$. Let us provide a few illustrations:

Example 1 (sale). Suppose that production is costless and that the seller sells the product to homogenous, price-taking consumers. Then, under such first-degree price discrimination

$$S_i(\widehat{\rho}) = \max\{E_{\widehat{\rho}}[b], 0\}$$

is independent of i, where $E_{\widehat{\rho}}[b] \equiv \widehat{\rho} b_H + (1 - \widehat{\rho}) b_L$ denotes the users' posterior assessment of quality.

Example 2 (sale with imperfect price discrimination). Following up on Example 1, assume now that there are two types of users, indexed by $a = a_H$ (proportion μ) or a_L (proportion $1 - \mu$) with $a_H > a_L$. If $\widehat{b} = E_{\widehat{\rho}}[b]$, the gross surplus of a user of type $j \in \{H, L\}$ is $a_j + \widehat{b}$. "Belief-sensitive pricing" arises when user surplus depends on posterior beliefs $\widehat{\rho}$,[1] i.e., when

$$a_L + b_H > \mu(a_H + b_H) \text{ and } a_L + b_L < \mu(a_H + b_L).$$

Then, $S_i(\widehat{\rho})$ (which again is independent of i) is given by

$$S_i(\widehat{\rho}) = \begin{cases} a_L + \widehat{b} & \text{for } \widehat{\rho} \geq \rho_0 \\ \mu(a_H + \widehat{b}) & \text{for } \widehat{\rho} < \rho_0 \end{cases}$$

where

$$a_L + [\rho_0 b_H + (1 - \rho_0) b_L] = \mu[a_H + \rho_0 b_H + (1 - \rho_0) b_L].$$

Buyers then have (average) utility

$$B(\widehat{\rho}) = \begin{cases} \mu(a_H - a_L) & \text{for } \widehat{\rho} \geq \rho_0 \\ 0 & \text{for } \widehat{\rho} < \rho_0 \end{cases}.$$

Example 3 (clientele effects / assortative matching). Some buyers may be interested solely in high-quality offerings. For example, financial institutions put, due to

[1] The other two cases are isomorphic to Example 1, as the volume of sales is not affected by beliefs.

prudential regulation reasons, a particularly high valuation on safe securities. Full grading allows the seller to better segment the market. Suppose that a fraction of buyers buy only high-quality products, at price Kb_H where $K > 1$. Other buyers are less discriminating and are as depicted in Example 1. Then

$$S_i(\widehat{\rho}) = Kb_H \mathbb{1}_{\{\widehat{\rho}=1\}} + \max\{E_{\widehat{\rho}}[b], 0\} \mathbb{1}_{\{\widehat{\rho}<1\}},$$

is again independent of i.

Example 4 (spillovers from adoption). A researcher whose paper is read and used by the profession, or a technology sponsor whose intellectual property becomes part of a royalty-free standard benefit only indirectly from adoption (prestige, referencing, diffusion of ideas for a researcher, network effects or spillover onto complementary products for a technology sponsor). Letting s_i denote the seller's gross benefit from adoption the seller's surplus is then:[2]

$$S_i(\widehat{\rho}) = s_i \mathbb{1}_{\{E_{\widehat{\rho}}[b] \geq 0\}}.$$

Note that in this case the seller's surplus in general depends directly on quality i.

Definition 1: Sellers are:

strongly information loving if for all ρ

$$S_i''(\rho) > 0 \quad \text{for } i \in \{H, L\} \quad \text{and } S_H'(\rho) \geq S_L'(\rho)$$

strongly information averse if for all ρ

$$S_i''(\rho) < 0 \quad \text{for } i \in \{H, L\} \quad \text{and } S_H'(\rho) \leq S_L'(\rho)$$

strongly information neutral if for all ρ

$$S_i''(\rho) = 0 \quad \text{for } i \in \{H, L\} \quad \text{and } S_H'(\rho) = S_L'(\rho).$$

This definition holds only for differentiable payoff functions. A weaker property (implied by definition 1 in the case of differentiable payoff functions) is:

[2] Where $\mathbb{1}_{\{\cdot\}}$ is the indicator function.

Definition 2: Sellers are:

information loving if

$$\rho S_H(1) + (1-\rho)S_L(0) > \rho S_H(\rho) + (1-\rho)S_L(\rho)$$

information averse if

$$\rho S_H(1) + (1-\rho)S_L(0) < \rho S_H(\rho) + (1-\rho)S_L(\rho)$$

information neutral if

$$\rho S_H(1) + (1-\rho)S_L(0) = \rho S_H(\rho) + (1-\rho)S_L(\rho).$$

If $b_L \geq 0$, the seller is information neutral in Examples 1 and 4, and information loving in Example 3. If $b_L < 0$, she is information loving when she fully appropriates the consumer surplus through a price (Examples 1 and 3).

By contrast, the seller is information averse if $E_\rho[b] > 0$ and if she is unable to charge the buyer and therefore has buyer adoption as her primary objective. The seller always benefits from a no grading, simple-acceptance policy (see Lerner-Tirole, 2006), weakly so in the two-type case when $b_L \geq 0$ (as in Example 4) and strictly so with two types and $b_L < 0$ or with a continuum of types, some of them negative. That way, she is able to "pool" negative-buyer-surplus states with positive-buyer-surplus ones.[3]

Certifiers. Profit-maximizing[4] certifiers audit quality. Throughout the paper, we will assume that, through reputation or a credible internal-audit mechanism, certifiers are able to commit to a disclosure policy, that is to a mapping from what they learn

[3] To illustrate information aversion, consider the following two examples from the Harvard campus. Harvard College has seen such rampant grade inflation that grades provided little information: in recent years, the median grade has been an A-, and over 80% of the students graduated with honors (Rosovsky and Hartley, 2002). At Harvard Business School, the School until recently had a formal policy that prohibited students from disclosing their grade point average to prospective recruiters (Schuker, 2005). Such "pooling" of certified students is much less common with second-tier institutions.

[4] Our results also hold if certifiers maximize their market share in the certification market.

to what they disclose to buyers.[5] This ability to commit to a disclosure policy makes the question of choice of their incentive scheme moot,[6], and so we can assume without loss of generality that they demand a fixed fee for the certification service. To sum up, a certifier's strategy is thus the combination of a fixed fee and a disclosure policy. In some instances, we will alternatively assume that certifiers do not charge fixed fees and that their objective is to maximize market share. When certifiers are atomistic and competition is perfect, the outcome will be exactly the same. Differences will potentially materialize when we consider monopolistic competition.

Because certifiers are useless unless they rule out the abysmal quality, we can consider three types of certifiers, two "minimum standard" certifiers and one "full grade" certifier:

A *tier-1* certifier ascertains that $b = b_H$ or $b \in \{b_L, -\infty\}$. Tier-1 certifiers furthermore do not disclose applications for which they find that $b \in \{b_L, -\infty\}$, as such disclosure of bad news (a "rejection") is unappealing to sellers and reduces the demand for such certifiers' services.

A *tier-2* certifier certifies that $b \in \{b_H, b_L\}$ or $b = -\infty$.[7]

A *multi-tier* certifier discloses the true quality: $b = b_H$, b_L or $-\infty$.

We will normalize the audit cost incurred by a minimum standard certifier to be 0. By contrast, the cost of a finer grading may be positive. Certifiers compete for

[5] It is not certain, of course, that this assumption always holds in the real world. For instance, some critics have accused rating agencies of initially being excessively generous when rating new offerings, then revising the rating months later. They suggest that the natural organizations to question this behavior, the investment banks, have little incentive to do so, because they have typically 'laid off' any exposure to the securities through refinancings (U.S. Securities and Exchange Commission, 2003). Certifiers' reputation building is analyzed in Bouvard-Levy (2008) and Mathis-Mc Andrews-Rochet (2008).

[6] An arbitrary incentive scheme gives rise to an equilibrium disclosure policy and therefore can be duplicated through a fixed payment (equal to the expected payment under the incentive scheme) and the resulting disclosure policy.

[7] Obviously, the certifier's reporting strategy for $b = -\infty$ is irrelevant, as the seller then always makes no profit. If by contrast we assumed that sellers have other products, the production of an "abysmal quality" could be a bad signal for other offerings. One would then expect that the information that $b = -\infty$ would not be disclosed either.

the sellers' business. The certification market, unless otherwise stated, is perfectly competitive. Equilibrium fees are then equal to 0.

Consider a seller who arrives at date t and chooses a certifier. She can contract with a single certifier in each period. Contingent on the outcome of certification(s), the seller chooses the date, $t + \tau$ ($\tau \geq 0$), at which she brings the product to the market. If the buyers' beliefs at that date are $\widehat{\rho} = \widehat{\rho}_{t+\tau}$, then the seller's utility is

$$\delta^\tau S_i(\widehat{\rho}_{t+\tau})$$

where $\delta < 1$ is the discount factor. Thus the seller maximizes

$$E[\delta^\tau S_i(\widehat{\rho}_{t+\tau})].$$

In our model, there are only two (relevant) levels of quality and audits of a given kind always deliver the same outcome.[8] And so a date-t product will actually be brought to the market either at t or at $t+1$.

There can be *fortuitous disclosure*: When a seller arrives at date t and does not bring her product to the market until date $t+1$, with probability $d \geq 0$, buyers exogenously discover that the date-(t+1) introduction corresponds to a date-t arrival. With probability $1-d$, buyers receive no such information.[9]

Finally, we will analyze perfect Bayesian equilibria. If multiple equilibria co-exist, that can be Pareto ranked for the sellers, we will select the Pareto dominant one.

3 Minimum standard certifiers

3.1 Determinants of tiered certification

Note that there is no point applying to a tier-2 certifier unless one goes to the market following an endorsement. Similarly, after an application to a tier-1 certifier,

[8]There is no certifier-idiosyncratic noise, unlike in Morrison-White (2005).

[9]Fortuitous disclosures will in equilibrium increase the cost of being rejected. Note that learning that the seller arrived at date t is here equivalent to learning that her application was rejected at date t. We could easily enrich the model by adding "slow sellers", who arrive at date t, but apply only at date $t+1$. Such sellers would suffer an unfair stigma if the date of their arrival is made public, as do papers in academia that authors are slow at submitting to a journal.

the seller brings the product to the market if the latter is a high-quality one and applies to a tier-2 certifier in case of rejection. The equilibrium thus exhibits the familiar pattern of moving down the pecking order, with diminishing expectations.[10]

Let x denote the fraction of sellers who choose an *ambitious strategy* (start with a tier-1 certifier, and apply to a tier-2 certifier in case of rejection). Fraction $1-x$ select the *safe strategy* (go directly to a tier-2 certifier).

When faced with a product certified by a tier-2 certifier, buyers form beliefs:

$\widehat{\rho} = 0$ if they know the product introduction is delayed (as they infer a rejection in the previous period), and

$\widehat{\rho} = \widehat{\rho}(x) \equiv (1-x)\rho / [1-x+x(1-\rho)(1-d)]$ otherwise.

Note that $\widehat{\rho}(x)$ decreases from ρ to 0 as x increases from 0 to 1.

Let

$$W^1(\widehat{\rho}) \equiv \rho S_H(1) + (1-\rho)\delta[dS_L(0) + (1-d)S_L(\widehat{\rho})]$$

and

$$W^2(\widehat{\rho}) \equiv \rho S_H(\widehat{\rho}) + (1-\rho)S_L(\widehat{\rho})$$

denote the expected payoffs[11] when applying to a tier-1 or tier-2 certifier, when certification by a tier-2 certifier delivers reputation $\widehat{\rho}$. Note that $\frac{\partial W^2}{\partial \widehat{\rho}} > \frac{\partial W^1}{\partial \widehat{\rho}} \geq 0$.

- *Safe-strategy equilibrium.* It is an equilibrium for sellers to all adopt a safe strategy ($x = 0$) if $W^2(\rho) \geq W^1(\rho)$:

$$\rho S_H(\rho) + (1-\rho)S_L(\rho) \geq \rho S_H(1) + \delta(1-\rho)[(1-d)S_L(\rho) + dS_L(0)],$$

or

$$(1-\rho)[(1-\delta)S_L(\rho) + \delta d[S_L(\rho) - S_L(0)]] \geq \rho[S_H(1) - S_H(\rho)]. \qquad (1)$$

Condition (1) captures the costs and benefits of a safe strategy. A safe strategy avoids delaying introduction when quality is low, thereby economizing $(1-\delta)S_L(\rho)$. It also prevents the stigma associated with fortuitous disclosure, and thereby provides

[10] An exception to this widespread pattern is provided by publications in law journals, where authors build on acceptance to move up the quality ladder.

[11] Conditional on $b \in \{b_L, b_H\}$.

gain $\delta d[S_L(\rho) - S_L(0)]$. The cost of a safe strategy is of course the lack of recognition of a high quality $S_H(1) - S_H(\rho)$.

Unsurprisingly, a safe-strategy equilibrium is more likely to emerge, the lower the discount factor (i.e., the longer the certification length), and the higher the rate of fortuitous disclosure. Indeed, when $\delta = 1$, the safe-strategy equilibrium never exists (i.e., even for $d = 1$) if the seller is information-loving.

- *Ambitious-strategy equilibrium*. Next, consider an equilibrium in which all sellers adopt an ambitious strategy. Certification by a second-tier certifier is then very bad news. Thus $x = 1$ is an equilibrium if and only if $W^1(0) \geq W^2(0)$:

$$\rho S_H(1) + \delta(1-\rho)S_L(0) \geq \rho S_H(0) + (1-\rho)S_L(0) \tag{2}$$

- *Mixed-strategy equilibrium*. Finally, consider a mixed equilibrium in which $x > 0$ (some sellers adopt an ambitious strategy), that is $W^1(\widehat{\rho}(x)) = W^2(\widehat{\rho}(x))$:

$$\rho S_H(1) + \delta(1-\rho)[(1-d)]S_L(\widehat{\rho}(x)) + dS_L(0)] = \rho S_H(\widehat{\rho}(x)) + (1-\rho)S_L(\widehat{\rho}(x)). \tag{3}$$

Condition (3) has a unique solution x, if it exists. Note also that whenever a mixed equilibrium exists, the safe-strategy equilibrium also exists, and it dominates the mixed equilibrium from the point of view of the sellers.

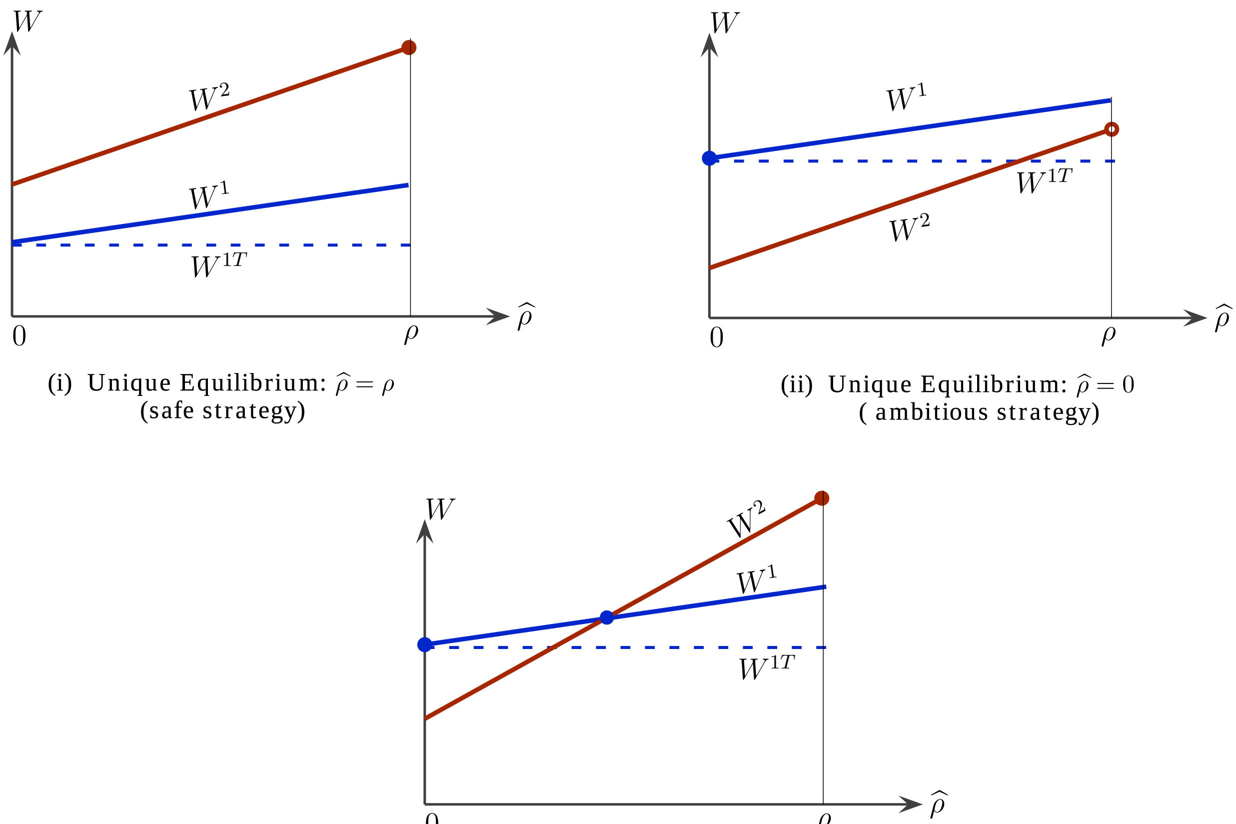
Interestingly, there may exist multiple pure equilibria. For example for $d = 0$, the conditions for the safe-strategy and the ambitious-strategy equilibria can be written:

$$\rho S_H(1) \leq \rho S_H(\rho) + (1-\rho)(1-\delta)S_L(\rho) \tag{4}$$

and

$$\rho S_H(1) \geq \rho S_H(0) + (1-\rho)(1-\delta)S_L(0). \tag{5}$$

Indeed, the sellers' certification strategies are *strategic complements*: Ambitious certification strategies devalorize tier-2 certification, thereby encouraging ambitious applications. Focusing on seller welfare W^1 and W^2, Figure 1 depicts the possible equilibrium configurations.



(i) Unique Equilibrium: $\widehat{\rho} = \rho$
(safe strategy)

(ii) Unique Equilibrium: $\widehat{\rho} = 0$
(ambitious strategy)

(iii) Three Equilibria.
Pareto-dominant one: $\widehat{\rho} = \rho$
(safe strategy)

Equilibrium configurations.

Proposition 1 *With minimum standard certifiers,*

(i) the (Pareto-dominant) equilibrium exhibits

- *the ambitious strategy of applying to a non-transparent tier-1 certifier, and then, in case of rejection, to a tier-2 certifier (tiered certification) iff*

$$(1-\rho)[(1-\delta)S_L(\rho)+\delta d[S_L(\rho)-S_L(0)]] < \rho[S_H(1)-S_H(\rho)],$$

- *the safe strategy of directly applying to a tier-2 certifier otherwise.*

(ii) ambitious strategies are more likely, the lower the probability of fortuitous disclosure (the lower d *is), and the more patient the seller (the higher* δ *is); when* $\delta = 1$ *and* $d = 1$ *ambitious strategies are adopted if and only if the seller is information loving.*

Let us comment on the interpretation of an equilibrium in which sellers do not apply for tier-1 certification, given that observed certifier rankings always start with "tier-1", almost by definition. One interpretation is that this particular class of sellers applies to tier-2 certifiers (on this, see also Section 4 below). Another interpretation speaks to the very definition of "tier-1", "tier-2", etc. What we here call "tier-2" could in practice be called "tier-1" if no seller applied to what we define as "tier-1" certifiers. For example, no "super tier-1" journal has been created that would be more demanding than the top-5 economics journals and take, say, the five best papers of the year.

An example of impatient sellers in many American universities is junior faculty members, who are about to come up for tenure. For instance, an assistant professor in the strategy group at a business school may submit a promising empirical analysis to Management Science, rather than submitting it to the American Economic Review. In part, this choice is driven by the different time frames that the two journals typically have for reviewing papers (on this, see Section 6). But in many cases, the junior faculty member senses that a rejection by a tier-1 certifier would make the track record at the tenure review too thin.[12]

Is lack of transparency linked to market structure?

To answer this question, assume by contrast that the market for tier-1 certification is monopolized, while tier-2 certifiers are still competitive. In the absence of transparency (NT), the tier-1 monopolist can demand fee

$$F^{NT} = W^1(\rho) - W^2(\rho)$$

whenever (1) is violated (i.e., whenever the sellers use the services of the tier-1 certifier). In cases (i) and (iii) of Figure 1, the sellers Pareto coordinate on the safe strategy for all $F^{NT} \geq 0$. Thus, under non-transparency, the outcome is the same as with a competitive tier-1 industry, except for the monopolist lump-sum payment F^{NT} in case (ii) of Figure 1.

[12]The junior faculty's impatience can reasonably be assumed to be common knowledge, and so we are performing comparative statics with respect to the discount factor (part (ii) of Proposition 1).

Suppose that instead the monopolist opts for transparency (T). He can then charge fee

$$F^T = W^1(0) - W^2(\rho) < F^{NT}$$

(assuming $F^T \geq 0$. If $F^T < 0$, then the monopolist faces no demand at any non-negative fee). We conclude that the absence of transparency is not driven by market structure.

Proposition 2 *Suppose that tier-2 certification is competitive. A monopoly tier-1 certifier opts for non-transparency so as to maximize the sellers' incentive to apply for tier-1 certification. Up to a lump-sum transfer, the outcome is exactly the same as for a competitive tier-1 industry.*

Note that this result would also hold if certifiers did not charge fees and cared only about market share: Regardless of the number of tier-1 certifiers, transparency is a dominated strategy.

3.2 Regulation of transparency

In reaction to the subprime crisis the US Treasury chose to require structured investment vehicles to disclose ratings (even unfavorable ones). This section studies whether regulation of disclosure increases welfare in industries in which sellers shop around for certification.[13]

Suppose that a regulator can require transparency of applications (this amounts to setting $d = 1$) and that this regulation cannot be evaded. Application to a tier-2 certifier yields ("T" refers to "transparency") $W^{2T}(\widehat{\rho}) = W^2(\widehat{\rho})$.

By contrast, application to a tier-1 certifier yields a lower payoff than in the absence of transparency:

$$W^{1T} = W^1(0) < W^1(\widehat{\rho}) \text{ whenever } \widehat{\rho} > 0,$$

[13] We focus on governmental regulations. An interesting and related subject of inquiry could be concerned with social regulation (social norms). For example, a social group may disagree when one of its members reveals a rejection incurred by another member (in professional or personal matters); society then "regulates" against transparency.

Application to a transparent tier-1 certifier (with payoffs as depicted by the dashed horizontal line in Figure 1) is an equilibrium behavior if and only if

$$W^1(0) \geq W^2(\rho).$$

And so if $W^1(0) < W^2(\rho) < W^1(\rho)$, or

$$\rho S_H(1)+\delta(1-\rho)S_L(0) < \rho S_H(\rho)+(1-\rho)S_L(\rho) < \rho S_H(1)+\delta(1-\rho)[(1-d)S_L(\rho)+dS_L(0)],$$

the transparency requirement increases the sellers' welfare: see case (ii) in Figure 1. In the other parameter configurations (cases (i) and (iii) in Figure 1) it has no impact on equilibrium outcomes and welfare.

Proposition 3 *Transparency improves sellers' welfare.*

Self-Regulation. Relatedly, would tier-1 certifiers agree among each other not to compete on the transparency dimension and to disclose applications? The answer is no, as they would thereby diminish their collective attractiveness. Put differently, a self-regulated disclosure requirement would either have no impact or drive tier-1 certifiers out of business.[14]

User welfare. How does transparency impact users' welfare? As we have seen, transparency regulation makes a difference only in case (ii) of Figure 1, by killing the ambitious-strategy equilibrium. The issue is thus whether users benefit from more or less information. The answer to this question is case-specific. In the first-degree price discrimination illustrations of Examples 1 and 3, users have no surplus and so we can confine welfare analysis to that of sellers. In Example 4, either $\rho b_H + (1-\rho)b_L \geq 0$ and then the equilibrium is always a safe-strategy one, or $\rho b_H + (1-\rho)b_L < 0$ and

[14] To prove these assertions, one must assume that certifiers are slightly differentiated (and thus can demand a positive fixed fee): As in Hotelling's model, the total cost for a buyer of using a certifier is the fixed fee charged by the certifier plus a function of the "distance" between the certifier and the buyer. For example, one can imagine that tier-k certifiers ($k = 1, 2$) are on an Hotelling-Lerner-Salop circle and that sellers are distributed randomly along the circle, incurring a transportation cost of "traveling" to a specific seller. One can then take the limit as the differentiation vanishes. In the absence of differentiation, profits are always equal to 0, and regulatory choices are a matter of indifference to the certification industry.

the equilibrium is always the ambitious-strategy one: In either case transparency is irrelevant.

The analysis is more interesting for Example 2 (imperfect price discrimination). In the belief-sensitive-pricing case in Example 2,[15] user net surplus in the ambitious-strategy and safe-strategy equilibria are:

$$B^1 = \delta(1-\rho)\mu(a_H - a_L)$$

$$B^2 = \begin{cases} \mu(a_H - a_L) \text{ for } \rho \geq \rho_0 \\ 0 \text{ for } \rho < \rho_0 \end{cases}$$

respectively. Thus a transparency regulation that moves the equilibrium from ambitious to safe strategies increases (decreases) user welfare if $\rho \geq \rho_0$ (if $\rho < \rho_0$). We thus see that while regulation always benefits sellers, it need not benefit users. This is a noteworthy observation, in view of the fact that transparency regulation is often heralded as protecting users; needless to say, with naive users, the case for transparency regulation would be stronger.

4 Seller self-knowledge

For expositional simplicity, we have assumed that the seller is a poor judge to assess the quality of her product for the buyers. In some cases, sellers are likely to have some information about the quality of their product. Suppose that a fraction α of sellers know their "type" (a fraction $1-\alpha$ have no clue, as earlier). Then, maintaining the assumption that only minimum-standard certification is available, knowledgeable H sellers apply to a tier-1 certifier, and knowledgeable L sellers apply to a tier-2 certifier.

[15] I.e., when $a_L + b_H > \mu(a_H + b_H)$ and $a_L + b_L < \mu(a_H + b_H)$. The sellers' payoffs in the two potential equilibrium configurations are:

$$W^1 = \rho(a_L + b_H) + \delta(1-\rho)\mu(a_H + b_L)$$

$$W^2 = \begin{cases} a_L + [\rho b_H + (1-\rho)b_L] \text{ for } \rho \geq \rho_0 \\ \mu[a_H + [\rho b_H + (1-\rho)b_L]] \text{ for } \rho < \rho_0. \end{cases}$$

As earlier let us look for the condition under which direct tier-2 applications by unknowledgeable sellers is an equilibrium. Let

$$\widehat{\rho} = \frac{(1-\alpha)\rho}{(1-\alpha)\rho + (1-\rho)}$$

denote the probability of high quality following certification by a tier-2 certifier. Condition (1) is replaced by

$$(1-\rho)[(1-\delta)S_L(\widehat{\rho}) + \delta d[S_L(\widehat{\rho}) - S_L(0)] \geq \rho[S_H(1) - S_H(\widehat{\rho})].$$

Because $\widehat{\rho} < \rho$, this condition has become harder to satisfy.

Proposition 4 *An increase in the fraction of sellers who are able to assess the quality of their product (an increase in* α*) makes tiered certification by the uninformed more likely.*

An improvement in the quality of self-assessment may therefore have an ambiguous impact on the probability of rejections: The direct and obvious effect is to reduce rejections by matching applications to the true quality. However, it increases the stigma attached to second-tier submissions (low-ambition applications are more likely to be low-caliber products): The choice of certifier then becomes a stronger signal of quality.

5 Endogenous quality

This section shows that our analysis is unchanged when the choice of quality depends on the equilibrium of the certification process. Suppose that quality depends on the seller's investment effort $e \in [\underline{e}, \overline{e}]$. We are interested in modeling a dimension of effort that affects the likelihood of a high quality outcome but does not change the probability of an abysmal outcome. It is reasonable to think that those margins respond to different forms of investment, and that for some of the examples that we have in mind, the latter margin would be quite inelastic.[16] Hence our focus on the former.

Let q be the probability that a product is not abysmal. A higher effort increases the probability of the high quality $\rho(e)$ outcome conditional on a non-abysmal outcome. Let $\psi(e)$ denote the disutility of effort. We assume that $\rho(e)$ is increasing and concave in e and that $\psi(e)$ is increasing and convex in e with $\rho'(\underline{e}) = +\infty$ and $\psi'(\underline{e}) = 0$. To simplify the analysis, we also assume that $S_L(.) = S_H(.)$ (as in Examples 1 through 3), and that $d = 0$.

We define two ex-ante payoff functions $\mathcal{W}^1$ and $\mathcal{W}^2$ as follows:

$$\mathcal{W}^1(\hat{\rho}) \equiv \max_e \{q[\rho(e) S(1) + \delta(1-\rho(e)) S(\hat{\rho})] - \psi(e)\}$$

and

$$\mathcal{W}^2(\hat{\rho}) \equiv \max_e \{qS(\hat{\rho}) - \psi(e)\}.$$

Let $e^1(\hat{\rho})$ and $e^2(\hat{\rho})$ be the solutions of the maximization problems underlying $\mathcal{W}^1$ and $\mathcal{W}^2$. Clearly, $e^2(\hat{\rho}) = \underline{e}$.

Lemma 5 *We have* $\frac{d\mathcal{W}^2(\hat{\rho})}{d\hat{\rho}} > \frac{d\mathcal{W}^1(\hat{\rho})}{d\hat{\rho}}$ *for all* $\hat{\rho}$.

Proof. By the envelope theorem,

$$\begin{aligned}
\frac{d\mathcal{W}^1(\hat{\rho})}{d\hat{\rho}} &= q\delta\left(1-\rho\left(e^1(\hat{\rho})\right)\right)\frac{d\mathcal{S}(\hat{\rho})}{d\hat{\rho}} \\
\frac{d\mathcal{W}^2(\hat{\rho})}{d\hat{\rho}} &= q\frac{d\mathcal{S}(\hat{\rho})}{d\hat{\rho}}
\end{aligned}$$

The result follows immediately. ■

There are two potential equilibria. The ambitious strategy equilibrium effort level e^{1*} and the safe-strategy equilibrium effort level e^{2*} are determined by the following equations:

$$e^{1*} = e^1(0) > \underline{e} = e^{2*}.$$

[16] More generally, the analysis extends straightforwardly to a small elasticity of abysmal quality to effort.

The safe strategy is an equilibrium if and only if

$$\mathcal{W}^2\left(\rho\left(\underline{e}\right)\right) \geq \mathcal{W}^1\left(\rho\left(\underline{e}\right)\right)$$

while the ambitious strategy equilibrium is an equilibrium if and only if

$$\mathcal{W}^1\left(0\right) \geq \mathcal{W}^2\left(0\right).$$

>From Lemma 1, an equilibrium always exists. The safe and risky strategy equilibria co-exist over a range of parameters. When there are multiple equilibria, we adapt our Pareto dominant selection criterion and select the ex-ante Pareto dominant equilibrium. The analysis is then identical to the case where effort is exogenous, with ρ replaced by $\rho\left(\underline{e}\right)$ and W^1 and W^2 replaced by $\mathcal{W}^1$ and $\mathcal{W}^2$. In particular, transparency weakly improves sellers' ex-ante welfare. When it does so strictly, it replaces an ambitious strategy equilibrium with high quality investment by a safe strategy equilibrium with low quality investment.

6 Quick turn-around

First- and second-tier certifiers may choose their certification delays so as to attract sellers. Shorter lags may increase the certification cost (here normalized at 0) or result in reduced accuracy. We focus on the latter for the moment.

To capture the idea that short turn-around times benefit the sellers, we assume that a quick turn-around certification takes less time (and therefore is subject to discount factor $\hat{\delta} > \delta$), while both tier-1 and tier-2 certification take one period.[17] Thus a seller who is rejected by a quick turn-around certifier could for instance apply to a tier-2 certifier without losing as much time as if he had been rejected by a tier-1 certifier. Furthermore, we will make assumptions so that it is never optimal to turn directly to a tier-2 certifier, and that it is never optimal to turn to a quick turn-around certifier after a rejection either by a tier-1 certifier or by a quick turn-around

[17] In order to avoid integer problems (and the concomitant possibility that the date of product introduction reveal the strategy), one must assume in this section that sellers arrive in continuous time (but the certification length is still discrete).

certifier. We further assume that $d = 0$, and that $S_H(\widehat{\rho}) = S_L(\widehat{\rho}) \equiv S(\widehat{\rho})$ for all $\widehat{\rho}$, so as to simplify the analysis.

Let

$$\rho^+ \equiv \frac{\rho(1 - z_H)}{\rho(1 - z_H) + (1 - \rho)z_L}$$

be the posterior belief following an H signal by a quick turn-around certifier. Without loss of generality, we assume that such a signal is good news for the quality of the product, i.e. that $\rho^+ > \rho$. This is equivalent to requiring that the fraction of false negatives and false positives be not too high: $1 > z_H + z_L$.

Our first assumption is sufficient to ensure that it is always preferable to turn to a tier-1 certifier and then apply to a tier-2 certifier rather than to apply directly to a tier-2 certifier:

$$S(1) > S(\rho) \frac{1 - (1 - \rho)\delta}{\rho}. \tag{6}$$

Our second assumption is sufficient to ensure that after a rejection by a tier-1 certifier, a seller does not want to try a quick turn-around certification next:

$$z_L < \frac{\delta(1 - \widehat{\delta})}{\widehat{\delta}} \frac{S(0)}{S(1) - \delta S(0)}. \tag{7}$$

Last, it must be the case that a seller does not want to turn to another quick turn-around certifier after being rejected by one. A sufficient condition for the absence of such repeated attempts is that false positives be perfectly correlated among quick turn-around certifiers, and so a failed attempt to be certified by such a certifier does not call for other attempts.

Given these assumptions, the only relevant strategic consideration is whether to apply to a quick turn-around certifier or to a tier-1 certifier. Denote by y the fraction of applicants who opt for a quick turn-around certification rather than tier-1 certifiers.

Let $\widehat{\rho}_2 = \widehat{\rho}_2(y)$ denote the posterior beliefs following tier-2 certification:

$$\widehat{\rho}_2(y) = \frac{y\rho z_H}{y\rho z_H + y(1 - \rho)(1 - z_L) + (1 - y)(1 - \rho)}.$$

We necessarily have $\rho^+ > \rho > \widehat{\rho}_2(y)$. With false positives, the higher y, the higher $\widehat{\rho}_2(y)$ and the lower the stigma associated with tier 2 certification.

Sellers turn to a certifier with low turn-around time rather than to a tier-1 certifier if and only if $\Psi(y) \geq 0$ where:

$$\begin{aligned}\Psi(y) &= \hat{\delta}[\rho(1-z_H)+(1-\rho)z_L]S(\rho^+)+[\rho z_H+(1-\rho)(1-z_L)]\hat{\delta}\delta S(\widehat{\rho}_2(y)) \\ &\quad -\delta[\rho S(1)+\delta(1-\rho)S(\widehat{\rho}_2(y))].\end{aligned}$$

The sign of $\Psi'(y)$ determines whether the choices between tier-1 certification and quick turn-around certification are strategic complements (positive sign) or substitutes (negative sign). Decisions are strategic complements if and only if

$$\rho z_H+(1-\rho)(1-z_L) \geq \frac{\delta}{\hat{\delta}}(1-\rho). \tag{8}$$

The left-hand side of (8) is the probability of being rejected when applying to a quick turn-around certifier. The right-hand side of (8) is the discounted probability of being rejected by a tier-1 certifier. Increasing y reduces the stigma of applying to a tier-2 certifier which impacts the payoff of both the tier-1 certification strategy and the quick turn-around application strategy in proportion to these probabilities. The higher z_H, the lower z_L and the lower δ, the more likely is (8) to be verified. It may be worth noting that strategic complementarity also obtains when the quick turn-around certifier mimics the acceptance rate of a tier-2 certifier.[18]

When (8) holds, then there can be multiple equilibria. This occurs when the following additional conditions are verified:

$$\Psi(0) < 0 < \Psi(1). \tag{9}$$

If there are multiple equilibria, the equilibrium where all sellers first turn to quick turn-around certifiers has higher seller welfare. Indeed, combining a revealed preference argument ($\Psi(1) > 0$) and the fact that $\rho S(1)+\delta(1-\rho)S(\widehat{\rho}_2(1)) > \rho S(1) + \delta(1-\rho)S(0)$ automatically yields the result. We maintain the maximization of seller

[18] Indeed, let the quick turn-around certifier receive a quality signal σ, with distributions $F_H(\sigma)$ and $F_L(\sigma)$ satisfying MLRP. The cutoff rule σ^* yields the same acceptance rate as a tier-1 certifier if

$$\rho z_H+(1-\rho)z_L = 1-\rho$$

where $z_H = F_H(\sigma^*)$ and $z_L = 1-F_L(\sigma^*)$.

welfare as our selection criterion, and so as long as $\Psi(1) > 0$, the economy will find itself in the quick turn-around equilibrium.

When (8) is violated, the equilibrium is unique, and may be in mixed strategies. If $\Psi(1) \geq 0$ (and hence $\Psi(0) > 0$), then the equilibrium involves quick turn-around certification. When $\Psi(0) \leq 0$ (and hence $\Psi(1) < 0$), then the equilibrium involves tier-1 certification. When $\Psi(1) < 0 < \Psi(0)$, then the equilibrium is in mixed strategies.

Proposition 6 *Suppose that* $0 < z_H < 1 - z_L$ *and that (6), (7) hold. If (8) holds, then the equilibrium involves quick turn-around certification if* $\Psi(1) \geq 0$ *and tier-1 certification otherwise. If (8) is violated, then the equilibrium involves quick turn-around certification when* $\Psi(1) \geq 0$, *tier-1 certification when* $\Psi(0) \leq 0$, *and mixed strategies otherwise.*

Market structure and quick turn-around

We now analyze how market structure affects the emergence of quick turn-around certification versus tiered certification. More specifically, we maintain the assumption that the market for tier-2 certifiers is perfectly competitive, and analyze the impact of the degree of competition among tier-1 certifiers. We maintain throughout the assumptions that $0 < z_H < 1 - z_L$, that (6) and (7) hold, and that $\Psi(1) > 0$.

The results turn out to depend on the nature of this competition. We analyze two cases. In case (a), tier-1 certifiers charge a fixed fee and maximize profits. In case (b), tier-1 certifiers do no compete in prices. Rather, they care about market share but have to incur a cost per submission, which depends on whether they opt for tier-1 or quick turn-around certification. Case (a) might be a better description of rating agencies while case (b) might be a better model of scientific journals.

We start with case (a). Assume that there is a single, monopolistic tier-1 certifier. This tier-1 certifier can choose between two strategies: tier-1 certification and quick turn-around certification. In each case, the monopolist extracts all the sellers' surplus over and above the sellers' welfare if the sellers were to go directly to a tier-2 certifier.

Therefore, the tier-1 certification strategy yields monopoly profit[19]

$$\delta\left[\rho S(1)+\delta(1-\rho)S\left(\rho\right)\right]-\delta S\left(\rho\right)$$

while the quick turn-around certification strategy yields monopoly profit

$$[\rho(1-z_H)+(1-\rho)z_L]\hat{\delta}S(\rho^+)+[\rho z_H+(1-\rho)(1-z_L)]\,\hat{\delta}\delta S(\rho)-\delta S\left(\rho\right)$$

The monopoly certifier will therefore opt for a quick turn-around certification strategy if and only if the monopoly profit is higher under the latter strategy than under the former. This can be expressed as $\Psi^M \geq 0$ where

$$\Psi^M \equiv \Psi(1)+\left[[\rho z_H+(1-\rho)(1-z_L)]-\frac{\delta}{\hat{\delta}}(1-\rho)\right]\hat{\delta}\delta\left[S(\rho)-S(\widehat{\rho}_2(1))\right].$$

Hence $\Psi^M > \Psi(1)$ if and only if (8) holds. Therefore, with a monopolist tier-1 certifier which charges a fixed fee and maximizes profits, quick turn-around certification is more (less) likely than under competitive markets if (8) holds (doesn't hold). Similarly, one can look at an oligopolistic tier-1 structure with two (or more) tier-1 certifiers competing in prices à la Bertrand: The outcome in the limit of small differentiation is the same as when tier-1 certifiers are perfectly competitive. If there is enough differentiation, on the other hand, then it can be the case in a Hotelling duopoly where (8) holds, that quick turn-around certification is less likely than under perfect competition (See Appendix 2).

We now turn to case (b). We assume that the tier-1 certifiers' objective function is given by

$$\text{[market share]} * [1-c]$$

[19] Let F be the fee charged by the monopoly tier-1 certifier. If

$$\delta S\left(\rho\right)\geq\delta\left[\rho S\left(1\right)+\delta\left(1-\rho\right)S\left(\rho\right)\right]-F$$

then the tier-2 equilibrium exists and Pareto dominates any other equilibrium. If this inequality is violated, then there is no tier-2 equilibrium and furthermore the tier-1 equilibrium exists as

$$\delta S\left(0\right)<\delta\left[\rho S\left(1\right)+\delta\left(1-\rho\right)S\left(0\right)\right]-F.$$

A similar reasoning applies to the computation of the monopoly profit under quick turn-around certification.

where $c = c_L$ for tier-1 certification and $c = c_H$ for quick turn-around certification. We assume that $c_L < c_H$. In the case of peer-reviewed scientific journals, for example, this might capture the cost for editors of pressing the referees to return their report quickly.

A monopolist tier-1 certifier would choose tier-1 certification with a payoff of $1 - c_L$ over quick turn-around certification which yields only $1 - c_H$. By contrast, in an oligopoly with two (or more) tier-1 certifiers where

$$(1 - c_L)/2 < 1 - c_H \tag{10}$$

then they will all choose quick turn-around certification.[20] Hence in this case, the oligopolistic game features a form of prisoner's dilemma and competition increases quick turn-around certification.

Proposition 7 *Suppose that (6), (7) hold, and that* $\Psi(1) > 0$. *The effect of competition on quick turn-around certification depends on the nature of competition. Competition decreases quick turn-around certification if certifiers charge a fixed fee and compete in prices so as to maximize profits if and only if (8) holds. By contrast, competition increases quick turn-around certification if tier-1 certifiers do not compete in prices but rather in market shares as long as (10) holds.*

The theoretical prediction that competition enhances quick turn-around certification when certifiers compete in market shares and not in prices is largely consistent with the historical experience among the leading academic journals in finance.[21] While certainly highly influential finance papers were also published in more general economics journals such as the *Journal of Political Economy* and the *Bell Journal of Economics*, for many years there was a single dominant finance journal, the *Journal*

[20] If there are n tier-1 certifiers, then the condition for the equilibrium to feature quick turn-around certification is

$$(1 - c_L)/n < 1 - c_H$$

which is weaker, the higher n.

[21] This and the following two paragraphs are based on conversations with several current and former editors of finance journals. We are particularly grateful to Cam Harvey and Bill Schwert for sharing historical data with us.

of Finance (*JF*). In 1973, Michael C. Jensen and his colleagues at the University of Rochester spearheaded the formation of a new journal, the *Journal of Financial Economics* (*JFE*).

One of the defining aspects of the *JFE* from its initial conception by its editors was its emphasis on rapid turn-around time for paper submissions. In its first two years, the median turn-around time for a submission was only three weeks. Due to stringent pressure from the editors, as well as the then-novel feature of paying referees for timely reviews (though the sums were rather nominal), review times remained under five weeks for a dozen more years. The speed of review was in dramatic contrast at the time to the other outlets where major finance publications appeared.

The emphasis on quick turn-around —in addition to the well-cited nature of many of the initial papers published in the *JFE*— proved to be extremely attractive to would-be authors. Consequently, the number of submissions to the journal soared: the rejection rate fell from 41% in 1972 to 20.5% in 1978 to 13.5% in 1984. The gap between the rejection rates of the JF and JFE in those years also narrowed, from 24% to 9% to 4%. During the 1980s, and particularly after the ascension of Rene Stulz to its editorship, the *JF* shortened the average time in which its papers were reviewed.

7 Multi-tier certification

Let us return to error-free certification, but assume now that certifiers can, at cost $c \geq 0$, provide a fine grade if they choose so (which, in a competitive certifying environment, is equivalent to the sellers' wanting a fine grade). We maintain the assumption that $d = 0$ for expositional simplicity. In the same way they do not want to disclose unsuccessful applications, tier-1 certifiers do not gain by transforming themselves into multi-tier certifiers. The question is then whether tier-2 certifiers disappear and how this affects the sellers' incentive to apply to tier-1 certifiers.

The broad intuition, which we develop in more detail below, goes as follows: Sellers who would otherwise have applied directly to a tier-2 certifier, can avoid the adverse-selection stigma by turning to a multi-tier certifier. This stigma avoidance however comes at a cost if sellers are information averse. If they are information loving or neutral, and the cost of fine grading is small, multi-tier certification drives out tier-2 certifiers; it also drives out tier-1 certifiers as resubmission after a rejection by a tier-1 certifier involves a delay and cannot prevent the buyers from knowing that quality is not high. Thus, if fine grading is costless, minimum-standard certification can survive only if sellers are information averse.

More generally, assume that $c \geq 0$, and consider first an ambitious-submission equilibrium ($x = 1$) under minimum-standard certification (Section 3). Sellers obtain $\rho S_H(1) + \delta(1-\rho)S_L(0)$. But they can avoid discounting and obtain $\rho S_H(1) + (1-\rho)S_L(0) - c$ by turning to a multi-tier certifier directly. The tiered-certification equilibrium therefore requires, besides condition (1), that

$$\rho S_H(1) + \delta(1-\rho)S_L(0) \geq \rho S_H(1) + (1-\rho)S_L(0) - c \Longleftrightarrow (1-\delta)(1-\rho)S_L(0) \leq c.$$

Second, consider a safe-strategy equilibrium ($x = 0$), and so condition (1) obtains. This equilibrium is robust to the introduction of full-grading if and only if furthermore

$$\rho S_H(\rho) + (1-\rho)S_L(\rho) \geq \rho S_H(1) + (1-\rho)S_L(0) - c,$$

i.e., when $c = 0$ if and only if the sellers are information averse.[22]

To sum up, sellers resort to multi-tier grading when its cost c is low, when sellers are impatient (δ is low), and when sellers are information neutral or loving.

Conversion to multi-tier grading is a potential defense strategy by tier-2 certifiers against the adverse-selection stigma. There is a sense in which tier-1 face less pressure to convert to multi-tier grading: Namely there exist $\overline{c}$ and $\underline{c}$, with $\overline{c} > \underline{c} > 0$ such that for $c \geq \overline{c}$, the equilibrium is as in Proposition 1 (i.e., a minimum-standard

[22] For the sake of completeness, we can consider a mixed equilibrium ($0 < x < 1$). A necessary and sufficient condition for this equilibrium to be robust to the introduction of fine grading is that the sellers who apply directly to a tier-2 certifier do not find it advantageous to go for a full grade:

$$\rho S_H(\widehat{\rho}(x)) + (1-\rho)S_L(\widehat{\rho}(x)) \geq \rho S_H(1) + (1-\rho)S_L(0) - c.$$

certification) and for $\underline{c} \leq c \leq \overline{c}$, the equilibrium remains a tier-1-certification equilibrium if this is what Proposition 1 predicts, but switches from a tier-2-certification equilibrium to a multi-tier equilibrium otherwise.[23]

Multi-tier grading as a defensive strategy by tier-2 certifiers seems to resonate with our academic experience. Illustrations include fine grading by Be Press and the proliferation of prizes offered by tier-2 journals (and not by tier-1 journals[24]).

Our assumption that certifiers can commit to a policy may be a bit stretched in the case of multi-tier grading. Suppose that such a commitment is enforced by reputational concerns, and consider a tier-2 certifier trying to break a tiered-certification equilibrium by converting into a multi-tier grade certifier. If sellers do not believe in this strategy, the certifier is deprived of high types and cannot (and has no incentive to) develop a reputation for accurate, fine grading. As we earlier announced, we leave foundations of commitment for future research, but we note that our commitment assumption may be more problematic for some forms of certification than for others.[25]

Proposition 8 *Multi-tier grading is more likely, the lower its cost, and the more*

[23] >From equation (1), tier-1 certification prevails whenever

$$\rho[S_H(1) - S_H(\rho)] \geq (1-\rho)(1-\delta)S_L(\rho).$$

Let

$$\overline{c} \equiv \rho[S_H(1) - S_H(\rho)] - (1-\rho)[S_L(\rho) - S_L(0)].$$

At $c = \overline{c}$, the tier-2 equilibrium starts being replaced by a multi-tier equilibrium. But

$$(1-\delta)(1-\rho)S_L(0) = \overline{c} - \delta[S_L(\rho) - S_L(0)] < \overline{c},$$

and so a tier-1 equilibrium is robust at $c = \overline{c}$.

[24] An apparent exception is provided by top finance journals. In their case, prizes may stem from a desire to provide an attractive alternative to top-5 economics journals for authors valuing publications in general economics outlets.

[25] We can however capture this idea through the following reduced form: Suppose that each certifier secretly chooses between spending 0 and spending c per review (say, by recruiting talented employees), and announces publicly its certification strategy (tier-1, tier-2, multi-tier); and that it incurs a finite penalty for incorrect rankings. No certifier has an incentive to invest in the cost c per review if sellers choose an ambitious strategy and believe that certifiers do not invest in the extra cost.

impatient and the less information-averse the sellers are.

Proposition 8 focuses on a competitive certifying industry. Appendix 1 by contrast considers a monopoly certifier who can costlessly engage in fine grading; it performs a mechanism design exercise and shows how efficient disclosure relates to the sellers' information aversion.

Proposition 8 may shed some light on rating agencies' practice of fine grading. As we observed in Example 3 (Section 2), bond ratings not only certify the quality of an issue but also allow matching between securities and buyers. This matching dimension became more important in the mid 1970s, when broker-dealers' regulatory assessment of solvency (and then insurers', pension funds', and, with Basel II, banks') started to make use of ratings, creating a strong demand for high-quality liquid claims. The mid-1970s coincidentally were a turning point in the business model of rating agencies, which switched to the issuer-pays mode.

8 Summary and conclusion

Certifiers such as rating agencies, journals, standard setting bodies or providers of standardized tests play an increasingly important role in our disintermediated market economies. Yet as scrutiny of rating agencies in the aftermath of the sub-prime crisis has shown, these organizations have complex incentive structures and may adopt problematic approaches. This paper makes an initial attempt at understanding how the certification industry caters to the certified party's demand through strategies such as the non-disclosure of rejections, and analyzes the welfare implications of such policies.

The first insight is that, in the absence of regulation, certifiers have a strong incentive not to publicize rejected applications.

On the normative side, sellers' gaming of the certification process involves costs: delay (or, in a variant of our model, duplication of certification costs) and possibly excessive information exposure; these costs were shown to provide a role for transparency regulation. We showed that transparency regulation always benefits sellers, but need not benefit users.

On the positive side, we examined when sellers are willing to take the risk of applying to a tier-1 certifier. This willingness hinges on the behavior of other sellers (which affects the stigma associated with a tier-2 acceptance), the discount factor (which impacts the cost of an ambitious submission strategy), the accuracy of the sellers' self-assessment (more realistic self-estimates favoring tiered certification), and sellers' information aversion (which determines the reputation-risk tolerance). We further showed that multi-tier grading may be a rational response by tier-2 certifiers to the stigma carried by their endorsement.

We also analyzed the impact of entry by certifiers who offer a low turn-around time and a lower accuracy. Such certifiers, if they appeal to sellers, create less stigma for tier-2 certification than tier-1 certifiers do. We characterized the conditions under which sellers will indeed turn to such "quick turn-around" certification. We further showed that the more competitive the industry, the more likely it is that certifiers offer a low (high) turn-around time if certifiers maximize market share (profits).

Finally, we examined when certifiers might adopt more complex rating schemes, rather than the simple pass-fail scheme. We highlighted that such nuanced schemes are more likely when the costs of such ratings are lower. In addition, these schemes are more common when sellers are less averse to the revelation of information about their quality and more impatient.

Turning back to Table 1, it is not surprising in light of our theoretical predictions that the bulk of the entries are under the opaque heading. State licensing examinations may be fundamentally different due to the presence of regulatory dicta. Entry-level examinations exhibit transparency and fine grading. These features may reflect the power imbalance between the buyers (colleges) and sellers (would-be students). In this instance, it is the buyers rather than the sellers who choose certifiers, which probably explains the unusual entry in Table 1.[26] Finally, and also consistent with our theory, it is not surprising that in situations where we would anticipate that risk aversion would be greatest (e.g., an undergraduate or MBA student going

[26] Top schools want to be matched with top students. They therefore have an incentive to demand tier-1 certification, or, better in an environment with mistakes, fine and transparent grading.

on the job market, an entrepreneurial firm going public), we see minimum standard certification rather than a fine-grained scheme.

This paper leaves open a number of interesting questions. We conclude by discussing a few of these.

- *Two-sided certification markets.*

We have assumed that certifiers cater to the sellers. This is the case in particular if buyers are dispersed and can share the information, and so certifiers cannot charge the buyer side.

Academic journals have traditionally charged the buying side. They bundled, however, the certification and distribution function. The distribution function nowadays can be performed through web sites and web repositories (although journals try to keep the two activities bundled through requirements not to keep papers posted once they are accepted). Does the recent advocacy in favor of open access publishing (charging authors rather than readers) reflect this new scope for unbundling? An interesting literature (e.g., McCabe-Snyder 2005, 2007a,b and Jeon-Rochet 2007) analyzes certification from the point of view of two-sided markets theory. In particular, it looks at when academic journals should charge readers or authors, and how the quality of certification is affected by this choice. By way of contrast, the issues of transparency and sequential certification remain yet to be investigated in this context. One may, for instance, wonder whether the certifiers' ability to charge buyers would lead to more transparency.

- *Horizontal aspects.*

Certifiers differentiate not only through their standards (the vertical dimension), but also with respect to the audience they target on the buyer side. For instance, an interesting question in academic certification is the relative role of generalist and field journals. In economics, for instance, the most valued publications are the top-5 generalist journals, but top field journals do extremely well and seem to dominate second-tier generalist journals.

Papers may be classified through their vertical component (quality) as well as the scope of their potential readership (a "generalist" paper is more appropriate for a broader audience than a "specialist" paper). A possibility is that being accepted at a good specialist journal carries less stigma than being accepted at a second-tier generalist one: the paper may have been rejected because it is too specialized, but still have very high quality.

The same patterns are seen in other contexts as well. For instance, from the 1960s through 1990s, four investment banks specializing in technology firms—Hambrecht & Quist, Alex. Brown, Robertson Stephens and Unterberg Towbin (later supplanted by Montgomery Securities)—had an influence that belied their modest sizes. They frequently participated in the underwriting of the largest technology offerings, often in partnership with the most prestigious "bulge bracket" investment banks (Brandt and Weisel, 2003). Similarly, a strategy adopted by many of the successful new entrants into the venture capital industry has been to adopt a well-defined specialization, and then seek to co-invest with prestigious groups which might not otherwise have considered working with a new organization.

- *Other second-tier certifier strategies to deal with adverse selection.*

Grading is a potential response by certifiers to adverse selection problems. We may think about other strategies. For example, second-tier journals sometimes organize successful special issues, which by building "network effects", may carry less stigma. It would be interesting to understand whether special issues have more appeal to second-tier journals, and, if so, whether this is due to a visibility effect (tier-1 journals having less need for visibility) or to a quality effect (special issues compromising quality less for tier-2 journals). In a similar vein, less established certifiers have attempted to distinguish themselves through innovation (for instance, Drexel Burnham Lambert's development of the junk bond market). These issues would deserve further exploration.

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Appendix 1 (mechanism design for a monopoly certifier under costless fine grading)

For expositional simplicity, we assume that the certifier does not discount the future (maximizes steady-state profits) and can perform fine grading at no cost ($c = 0$). Adopting a mechanism design approach, let $F_H(\widehat{\rho})$ and $F_L(\widehat{\rho})$ denote the c.d.fs of posterior beliefs when the seller comes to the market for types H and L, respectively.

The certifier solves:

$$\mathcal{S} \equiv \max_{\{F_H(\cdot), F_L(\cdot)\}} \{\rho \int S_H(\widehat{\rho}) dF_H(\widehat{\rho}) + (1-\rho) \int S_L(\widehat{\rho}) dF_L(\widehat{\rho})\}$$

s.t.

$$\rho \widehat{\rho}_H + (1-\rho)\widehat{\rho}_L = \rho \tag{11}$$

where

$$\widehat{\rho}_i \equiv \int \widehat{\rho} dF_i(\widehat{\rho}) \quad \text{for} \quad i \in \{H, L\}$$

$$\widehat{\rho}_H \geq \rho \quad \text{and} \quad \widehat{\rho}_L \leq 1-\rho.$$

In words, $\widehat{\rho}_i$ is the average ex post reputation of type i. Condition (11) just expresses the martingale property of beliefs.

Rather than solving this program in full generality, we study several cases of interest.

(a) *Sellers are strongly information loving.*

In this case, the convexity of S_i implies that

$$\mathcal{S} \leq \ \mathcal{T} \equiv \rho[\widehat{\rho}_H S_H(1) + (1-\widehat{\rho}_H) S_H(0)] + (1-\rho)[\widehat{\rho}_L S_L(1) + (1-\widehat{\rho}_L) S_L(0)].$$

Maximizing $\mathcal{T}$ with respect to constraint (11) (with multiplier μ) yields first-order conditions:

$$\frac{\partial \mathcal{L}}{\partial \widehat{\rho}_H} = \rho[S_H(1) - S_H(0) - \mu] \leq 0, \quad \text{with equality if} \quad \widehat{\rho}_H > 0$$

$$\frac{\partial \mathcal{L}}{\partial \widehat{\rho}_L} = (1-\rho)[S_L(1) - S_L(0) - \mu] \leq 0, \quad \text{with equality if} \quad \widehat{\rho}_L > 0.$$

Because $S_H(1) - S_H(0) \geq S_L(1) - S_L(0)$, the program admits $\widehat{\rho}_H = 1$ and $\widehat{\rho}_L = 0$ as a solution: Fine grading is optimal, and

$$\mathcal{S} = \rho S_H(1) + (1-\rho) S_L(0).$$

(b) *Sellers are strongly information averse.*

A symmetric proof shows that it is then optimal to have tier-2 certification. And so:

$$\mathcal{S} = \rho S_H(\rho) + (1-\rho) S_L(\rho).$$

(c) *Spillovers from adoption (example 2).*

Suppose (as in Lerner-Tirole 2006) that

$$S_i(\widehat{\rho}) = s_i \mathbb{1}_{\{E_{\widehat{\rho}}[b] \geq 0\}}.$$

Clearly if $E_\rho[b] = \rho b_H + (1-\rho) b_L \geq 0$, the optimum is a pooling one (tier-2 certification). So let us assume that

$$\rho b_H + (1-\rho) b_L < 0.$$

Let $\rho^* > \rho$ be defined by

$$\rho^* b_H + (1-\rho^*) b_L = 0.$$

One has:

$$\mathcal{S} = \rho s_H + \frac{\rho(1-\rho^*)}{\rho^*} s_L.$$

Put differently, the certifier "accepts" all high types and a fraction u of low types, such that

$$\rho^* = \frac{\rho}{\rho + (1-\rho)u}.$$

Optimal certification is then intermediate between a tier-1 and a tier-2 certifier: less stringent than the former, but more demanding than the latter.

Appendix 2 (quick turn-around equilibrium in a Hotelling duopoly game)

Consider a Hotelling duopoly game between two tier-1 certifiers where the differentiation parameter t is large enough so that both firms have positive market share. In a symmetric, pure-strategy equilibrium, then each firm charges fee $F = t/2$. Let

$$W^1(\hat{\rho}_2) \equiv \rho S(1) + \delta(1-\rho) S(\hat{\rho}_2),$$

$$W^3(\hat{\rho}_2) \equiv \frac{\hat{\delta}}{\delta}\left[\left[\rho(1-z_H) + (1-\rho) z_L\right] S(\rho^+) + \delta\left[\rho z_H + (1-\rho)(1-z_L)\right] S(\hat{\rho}_2)\right]$$

and let

$$\rho^- \equiv \hat{\rho}_2(1).$$

Hence,

$$\Psi^M = \delta\left[W^3(\rho) - W^1(\rho)\right]$$

and

$$\Psi(1) = \delta\left[W^3(\rho^-) - W^1(\rho^-)\right].$$

Consider a quick turn-around equilibrium. If one of the two certifiers deviates to become tier-1 and charges F (in general, $F \neq t/2$), then the market share of the other certifier is

$$y \equiv \frac{t + (t/2 - F) + \delta\left[W^3(\hat{\rho}_2(y)) - W^1(\hat{\rho}_2(y))\right]}{2t}. \tag{12}$$

It is easy to show that, for the optimal F associated with the deviation

$$W^1(\hat{\rho}_2(y)) > W^3(\hat{\rho}_2(y))$$

for the deviation to be profitable. In particular, the deviator can charge $F = t/2$ (not optimal). If

$$W^1(\rho^-) \geq W^3(\rho^-)$$

then for y given by (12), $\hat{\rho}_2(y) < \rho^-$ and

$$W^1(\hat{\rho}_2(y)) > W^3(\hat{\rho}_2(y))$$

if (8) holds. And so, the quick turn-around equilibrium exists for a smaller set of parameters than for a perfectly competitive industry.