The Ownership of Ratings

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Abstract

In 2003, Standard & Poor’s, aiming at assessing company’s corporate government practices, proposed a new type of contract providing the auditee with the ability to withhold the rating. In this paper, we investigate under what circumstances such simple ownership contract can emerge as the optimal arrangement. We show that the transfer of ownership over ratings to firms can emerge as the optimal contractual arrangement only if firms are sufficiently uncertain of their quality at the time of hiring the certification intermediary, the decision to get a rating is not observable and competition between different intermediaries is sufficiently fierce.

Key Words: Certification, Corporate Governance.

Jel Classification:
1 Introduction

On January 31st, 2003, Standard & Poor’s assigned its first Corporate Governance Score (CGS) to a US company, the Federal Mortgage Association, Fannie Mae. Standard and Poor’s corporate governance scores reflect its assessment of company’s governance practices on a scale from 1 to 10 (incidentally, Fannie Mae was given a score of 9), and are based on a review of four important areas: ownership structure and influence, financial stakeholder rights, financial transparency and board structure. Those scores are described by S&P as independent assessments resulting form an interactive process that does not follow a “check the box” approach. It is therefore likely that those scores reflect some judgement by S&P of the governance quality and as such contain information not widely available otherwise. Importantly, the score is made public at the company’s discretion. Quoting from S&P’s website: “The resulting report can either be used as a confidential diagnostic by the company or published as a Corporate Governance Score (CGS) .... A CGS is funded by the company being analysed and is currently provided free of charge to investors, insurers and other interested parties”. In the same vein, it is noticeable that S&P commits not to reveal whether a particular company has even approached them for a score “Assessments can be provided to companies on a confidential basis”. In short, companies pay a fee to hire S&P, then a score is produced, and the company may decide to disclosure it at no extra fee. In fact, the option not to reveal the score is often exercised. S&P launched this product in the US in 2002 but started providing scores outside the US in 2000. In conversations with S&P, it appeared that a “good majority” of firms do not reveal their scores.

Although this business model is relevant to academics and practitioners involved in the important debate on corporate governance, and more specifically on the issue of whether a “market” solution will produce the right kind of information to investors, Standard & Poor’s contractual offer is also of some interest to contract theorists at large. On page 30 of his 1995 book, Oliver Hart argues that “the owner of an asset has residual control rights over that asset: the right to decide all usages of the asset in any way not inconsistent with a prior contract, custom or law”. It thus appears to us that what S&P is selling to firms is the ownership of an informational asset, their corporate governance score. Our research question is to identify the circumstances under which such a simple contract can emerge as the optimal possible arrangement.

To answer that question, we take a mechanism design approach and consider successively different market structure of the “rating” market. Our main result is that the transfer of
ownership over ratings to firms can indeed emerge as the optimal contractual arrangement but only if firms are sufficiently uncertain of their quality at the time of hiring the certification intermediary, and only if at the same time, competition between different intermediaries susceptible to produce those kind of services is sufficiently fierce. Therefore we derive the result that simple ownership contracts can be the outcome of a competitive process. A related result is that competition between intermediaries will lead to less information revealed. This, in the perspective of corporate governance or more generally of the working of certification markets, leads us to conclude that competition may actually be quite damageful.

The existing literature does not suggest that ownership contracts of the type documented above could be optimal. In an important paper, Alessandro Lizzeri (1999) shows two results. First, a monopolist intermediary will commit to never reveal its rating and will optimally make a simple announcement to the effect that a given firm has hired its services. If market participants expect every firm to hire such an intermediary, the absence of this announcement is an out of equilibrium outcome. Lizzeri shows that the only possible out of equilibrium beliefs must be that market participants (investors, consumers...) then take that firm to be of the lowest possible quality. Firms are then indifferent between going to the intermediary, and being extracted all the surplus created by this decision, or being mistaken for the worst kind. In a second result, Lizzeri shows that competition may lead to full information revelation. The divergence between our results comes from us allowing intermediaries to charge fees contingent on the quality observed, but also from our insistence on renegotiation-proof contracts. In a related contribution, Eloïc Peyrache and Lucia Quesada (2004) show...

Our analysis is a mechanism design exercise that involves both screening and signaling elements. With rational market participants, not revealing a rating is informative and will lead market participants to update their beliefs about those firms. The intermediary then wants to screen firms but has to account for the fact that their reservation utilities depend on the form of contract that the intermediary actually offers. It thus bears some relation with the literature on mechanism design with type dependent reservation utilities (Jean-Charles Rochet and Lars Stole 2002). But it also shares some features with the general set-up analysed by Ilya Segal and Mike Whinston (1999, 2003) as ours is a case of contracting with (informational) externalities. Our final section will deal with competition in contracts in such a context. Finally, there is also a literature on rating agencies that studies the reputational incentives of those agencies to manipulate their ratings (e.g. Roland Benabou and Guy Laroque 1993, or Beatriz
Mariano 2004 and Enrico Sette 2004 among others). We ignore this issue, and concentrate on the signaling implications of the decision to hire a certification intermediary. We believe this feature to be most important in certification markets like corporate governance scores where the decision to hire such intermediary is discretionary and not directly dependent on other related decisions. In contrast, obtaining a rating is a pre-requisite to the issuance of bonds and this conditionality minimizes the relevance of signaling issues.

The paper is organized as follows. A brief second section introduces the model. Section 3 examines the best policy of a monopolist intermediary. Section 4 analyses the competitive case.

2 The model

This section sketches the main ingredients of the model. Consider a firm, a certification intermediary and a number (≥ 2) of competitive, risk neutral\(^1\) investors. A firm’s governance comes in various qualities which result in a value of \(v\) for its investors. Absent any additional information, we take for granted that investors consider \(v\) to be distributed according to some density \(f(v)\). We take in fact \(f(v)\) to be the uniform density\(^2\) on \([0, 1]\). Therefore, initially, investors regard any firm as average, and take its value to be \(\frac{1}{2}\). Suppose that, at the time of hiring the intermediary, the firm only get a signal \(\mu\) about \(v\). We assume that \(\mu\) is uniform on \([v - \theta, v + \theta]\). In the core of the paper, we successively consider settings where the firm is perfectly (\(\theta = 0\)), or imperfectly (\(\theta > 0\)), informed of its own type.

The intermediary possess a certification technology which provides a revealing signal \(\sigma\) about the true value of \(v\) at a cost \(c > 0\). We suppose that \(\sigma\) is uniform on \([v - \omega, v + \omega]\). Except in one occasion, we will concentrate on the case where the signal is perfectly revealing, i.e. \(\omega = 0\). We consider this signal to be hard information. That is, it can either be concealed or truthfully revealed. This can be viewed as a short cut for reputation concern of the intermediary\(^3\).

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\(^1\)This assumption implies that there is no social value of information. The reader may then wonder why it is of any interest to study what information will be revealed in equilibrium in such a setting. It will be easy to incorporate in our model a loss function that would justify the need to provide accurate information to investors. We take the short cut that ultimately the more information is revealed by the rating intermediary, the better it is for society.

\(^2\)Uniform distribution allows us to derive in most cases explicit solutions. We will make clear what properties of the uniform distribution are important for our results to hold.

\(^3\)Our setting is thus quite different from the literature that studies the incentives of financial information.
We first assume the intermediary to be a monopolist uniquely placed to provide corporate governance ratings. In a later step, a section will deal with alternative scenarios where different intermediaries compete to attract firms.

The intermediary and the firm can enter into a transaction by which in exchange of a fee, the intermediary performs an audit that results in a rating of its corporate governance. We do not put any restriction on the class of contracts that can be offered to the firm. Based on the information they obtain, investors update their beliefs regarding the quality of the corporate governance and, given that they are risk neutral, pay the expected quality.

The timing of the game can be summarized as follows. Nature chooses $v$ and firms get an \([\text{perfectly/imperfectly}]\) informative signal on their true value $v$. Not observing any of these variables, intermediaries post (simultaneously in the competitive case) contracts that can stipulate both an upfront fee $p_0$ and a fee contingent on what rating is ultimately obtained $p(v)$ and a disclosure rule $d(v) \in [0, 1]$ where $d = 0$ means that the rating is not revealed. Observing the contract offers, firms can approach an intermediary to provide a rating. The contract also specifies whether this information is to be made public or not. Once a firm hires an intermediary, the score is then revealed or not to the market. Finally, market participants update their beliefs on $v$, using Bayes’ rule whenever possible. The firm’s value is then equal to the updated expected value of $v$, given all the information provided.

3 A Monopolist Intermediary

We first derive the willingness to pay of a firm for any contract offered by the intermediary. To simplify exposition consider first the case where $\theta = 0$ : at the time of deciding to accept the intermediary’s contract the firm is perfectly informed on its type. Denote by $\phi$ the information that market participants have when no rating is revealed. The absence of a rating does not imply that market participants keep their prior beliefs: they may learn something from the fact that no rating is revealed. For instance, if they observe that the firm went to see the intermediary, they understand that the absence of a rating signifies that the firm’s type is one for which $d(v) = 0$. If instead, the hiring of the intermediary is kept secret, market participants may still infer from the absence of a rating that either the firm belongs to the set of values $v$ for which $d(v) = 0$ or to the set of firms that do not hire the intermediary. In general denote providers in the context of cheap talk games, as in Mariano (2004) or Sette (2004): there, the rating agency can fully manipulate its report.
by $E[v/\phi]$ the updated value that market participants place on a firm without a rating.

A firm of type $v$ will go to the intermediary iff:

$$d(v)v + (1 - d(v))E[v/\phi_1] - p(v) - p_0 \geq E[v/\phi_0]$$

in the case of secret contracting, $\phi_1 = \phi_0$ as market participants cannot tell whether the absence of a rating is due to the firm not hiring the intermediary or the intermediary hiding the rating of a rated firm. But in the case of public contracting, our previous discussion has highlighted that these two information sets may differ.

As $p(v)$ can be contingent on $v$, it is quite immediate that any firm that hires the monopolistic intermediary will just be indifferent between doing so or not: the intermediary can extract all the firm’s rent. Therefore the best contract from the intermediary will return

$$d(v)v + (1 - d(v))E[v/\phi_1] - E[v/\phi_0]$$

on each firm that the intermediary finds worthwhile rating. Therefore the intermediary’s objective is simply to maximize:

$$\Pi = \max_{d(v), V_1} E_{v \in V_1} [d(v)v + (1 - d(v))E[v/\phi_1] - E[v/\phi_0] - c]$$

where $V_1$ denotes the set of types that hire the intermediary.

**Definition:** a threshold equilibrium is defined as an equilibrium in which all types $v$ above a certain threshold $\hat{v}$ hire the intermediary, while all those below do not.

**Lemma 1** All equilibria belong to the class of threshold equilibria.

**Proof.**

Suppose to the contrary that $\sigma \equiv \sup V_1 < 1$ and let us show that this cannot be part of a profit maximising strategy. Consider instead the possibility that the intermediary offers to all $v \in [\sigma, 1]$ the contract offered to $\sigma$. The willingness to pay of all those types, $d(v)v + (1 - d(v))E[v/\phi_1] - E[v/\phi_0]$ is no less than $\sigma$’s. Moreover, such a policy would (weakly) reduce $E[v/\phi_0]$ as now better types are rated with probability $d(\sigma) > 0$ ($= 0$). In the case of public contracting, such a policy would also increase (weakly) $E[v/\phi_1]$ as better types hire the intermediary but reveal a rating with probability $d(\sigma) < 1$ ($= 1$). In the case of secret contracting, the intermediary wants as well $E[v/\phi_1] = E[v/\phi_0] = E[v/\phi]$ as small as possible and providing ratings of better types (weakly) reduces $E[v/\phi]$. Therefore it must be that $\sup V = 1$.

It cannot be either that there exist $v_1 < v_2 < v_3$ so that $v_1$ and $v_3 \in V_1$ while $v_2 \notin V_1$. Suppose to the contrary that this would be the case and take $v_3$ to be the highest type above which all firms hire the
intermediary. Again, \( v_2 \)’s willingness to pay is no less than \( v_1 \)’s. In the case of secret contracting, any subset of types \( v \in [v_1, v_3] \) that is added in \( V_1 \) also allows the intermediary to (weakly) reduce \( E[v/\phi] \).

In the case of public contracting, the intermediary can make offers to some subset of types \( v \in [v_1, v_2] \) but \( v \notin V_1 \), that are accepted, while at the same time making offers to some subset of types \( v \leq v_1 \) for whom \( v \in V_1 \) that are now rejected to guarantee that \( E[v/\phi_1] \) does not decrease. This would weakly reduce \( E[v/\phi_0] \) and therefore increase the monopolist’s profits.

Better types offer better profit opportunities for the intermediary. Moreover contracting with better types allows the intermediary to reduce the average quality of the pool of firms that do not hire its services. The threshold nature of any equilibria allows us to derive the next result.

**Lemma 2** For any distribution of types \( v \in [0, 1] \) for which \( E[v] = 1/2 \) and so that \( E[v/v \leq x] \geq \frac{x}{2} \) for all \( x \), it is the case that the intermediary’s profit cannot exceed \( 1/2 - c \).

**Proof.**

See Appendix 1.

The uniform distribution happens to satisfy the condition of the lemma, as so does for instance any increasing density. Under the assumption that the intermediary cannot offer contingent contracts (i.e. \( p(v) = p \) for all \( v \)), Lizzeri (1999) had shown that the optimal contract in the monopolist case is to offer \( p_0 = 1/2 \) and \( d(v) = 0 \) for any \( v \) and to make public the information that the firm hired the intermediary. This equilibrium is supported by out of equilibrium beliefs that a firm that does not hire the intermediary must be worth zero (and this out of equilibrium beliefs appear to be the only ones that can support an equilibrium). One consequence of the previous lemma is that Lizzeri’s result is robust to the introduction of contingent prices: the contract he proposes returns just \( 1/2-c \) to the monopolist and as such remains optimal in our context. We now introduce an important assumption of our analysis which generates diverging results:

**Assumption:** Parties cannot commit not to renegotiate.

Whatever the contract signed initially, we require that there is no deviation at any stage of the game that would be preferred by both the intermediary and the firms. Notice that now, the contract \( p_0 = 1/2 \) and \( d(v) = 0 \) for any \( v \) is not renegotiation-proof: a firm of type say \( v = 1 \) that has hired the intermediary is willing to pay an extra fee (at most \( 1-1/2 \)) for the intermediary to reveal that \( v = 1 \), instead of remaining valued as an average firm in the
absence of such an announcement along the equilibrium path. One can suspect that this process unravels, and indeed we can show:

**Lemma 3** When \( \theta = 0 \), the only renegotiation-proof equilibria have \( d(v) = 1 \) for any firm that hires the intermediary.

**Proof.**

Let us start with the case of public contracting. Suppose instead that there is a \( v \in V_1 \) for whom \( d(v) < 1 \). For this to be renegotiation-proof it must be that \( v \leq E[v/\phi_1] \). Otherwise, whatever the initial contract there will be additional gains to trade from revealing \( v \). Therefore, in any putative equilibrium, all firms with \( v > E[v/\phi_1] \) will reveal their rating. This process unravels so that \( \phi_1 = \emptyset \).

Consider now the case of secret contracting. Suppose that there is a \( v \in V_1 \) for whom \( d(v) < 1 \). For this to be renegotiation-proof it must be that \( v \leq E[v/\phi] \). Because any equilibria is a threshold equilibrium, \( E[v/\phi] \leq E[v/\phi \cap v \geq \hat{v}] \) where \( \hat{v} \) is the level above which firms secretly hire the intermediary. Therefore the firm would prefer the intermediary to make it public that it has hired its services. Given that this deviation would be profitable for any firm that has hired the intermediary, the situation would then be similar to the case of public contracting and the same unraveling argument applies.

This lemma implies that in the case where the firm is fully informed of its type at the time of hiring the intermediary, there is no difference between public and secret contracting. In both cases, a firm without a rating can only be a firm that has not hired the intermediary. Together with the first lemma, this implies that the intermediary’s objective now simplifies to:

\[
\max_{\tilde{v}} \int_{\tilde{v}}^{1} \left[ v - E[v/v \leq \hat{v}] - c \right] dF(v)
\]

Under our assumption of uniform distribution\(^4\), we then obtain

**Proposition 1** When \( \theta = 0 \), the unique renegotiation-proof contract is for the intermediary to offer \( p_0 = 0 \) and \( p(v) = v \) and \( d(v) = 1 \), \( \forall v \). This results in a profit level of \( 1/2 - c \) for the intermediary.

To be precise, the equilibrium outcome is unique, but there is an indeterminacy in prices as long as \( p_0 + p(v) = v \). It is immediate to check that this contract returns exactly \( 1/2 - c \) to

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\(^4\) Appendix 1 derives the optimal policy for any distribution of firm’s types. It is shown there in particular that the results contained in Proposition 1 remain unchanged for any distribution centered on \([0,l]\) that satisfies \( E[v/v \leq \tilde{v}] \geq \frac{c}{2}, \forall \tilde{v} \).
the intermediary. Again, it can be supported by the out of equilibrium beliefs that a firm that does not have a rating must be worth zero.

It is worth emphasizing that there is some cross-subsidisation between types. Indeed whenever $v \leq c$, the intermediary loses money on those types. It still pays for the intermediary to take them on, as not doing so will admittedly save $v - c$ but will reduce the willingness to pay for its services of all firms with higher values as it would increase $E[v/\phi]$. The situation is in fact quite similar to a discriminating monopolist who starts contracting with the consumers with the highest valuation to pay, and who is surely willing to do so with all consumers with a valuation exceeding his cost of delivering the good or service (as again, the monopolist extracts all the surplus). But there is an extra effect in our set up: as the monopolist walks down the demand curve, the demand curve is shifted upward. This second effect explains that the monopolist is willing to contract with types with a lower valuation than $c$. The fact that the monopolist prefers taking all the types is specific to the assumption that the distribution of types has an average of 1/2 (i.e. centered on $[0,1]$), but this trade-off between making a loss of low types but increasing the willingness to pay of all types above is general.

**Proposition 2** the optimal contract is implementable with a simple ownership contract where the intermediary owns the rating and where the firm and the intermediary renegotiate over its revelation.

Indeed, the ownership of the rating confers to the intermediary the right to use this informational asset in any way it wants. In particular, the intermediary has the right to hide the rating. This would result in the firm being valued at $E[v/\phi]$ and therefore the intermediary can bargain to extract $v - E[v/\phi]$. In our case where the intermediary takes on all the types, the previous out of equilibrium beliefs imply $E[v/\phi] = 0$.

We now check that the previous two results are unaltered when we consider the possibility of noisy ratings ($\omega > 0$) and the firm being uncertain about its true type ($\theta > 0$).

Consider first the possibility that the intermediary’s rating is a noisy estimate of $v$. To make things concrete, suppose that the rating produced by the intermediary, $\sigma$, is now uniformly distributed between $\theta - \omega$ and $\theta + \omega$. We show:

**Proposition 3** Intermediary’s ownership cum renegotiation is still the unique optimal renegotiation-proof contract that returns $1/2 - c$ to the intermediary when $\omega > 0$. 

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The proof is immediate: once a rating is produced, the firm’s willingness to pay for its disclosure is $E[v/\sigma] - E[v/\phi]$. Suppose the intermediary offers the previous contract, and let us postulate that this is accepted by all firms. Then, with the previous out of equilibrium beliefs that a firm without a rating is worth zero, the willingness to pay of each type of firm is $E[v/\sigma]$. All types of firms hire the intermediary and as on average the rating is right, the intermediary gets $\frac{1}{2} - c$.

This result implies that the intermediary cannot generate extra profits by offering the option to hide the rating when the rating technology is imperfect. This runs somehow against the intuition that this option may be valuable when a rating can be wrong: firms would get some protection against low ratings. But this intuition ignores an important point: when the firm is fully informed on its type, and when necessarily the equilibrium has a threshold structure, a low rating cannot be bad news: market participants know that the firm’s true value must be above a certain threshold. They would then disregard any rating that would suggest otherwise, on the account that the rating technology is noisy and that such a rating must be a “mistake”. Therefore the option to hide a rating has no value in any threshold equilibrium including one where all types hire the intermediary.

We now turn our attention to the case where the rating technology is perfect but where the firm may be uncertain about its type at the time of hiring the intermediary ($\omega = 0, \theta > 0$).

**Proposition 4** Intermediary’s ownership cum renegotiation is still the unique optimal renegotiation-proof contract that returns $1/2 - c$ to the intermediary when $\theta > 0$.

**Proof.**

See Appendix 2.

Suppose that the intermediary still offers the previous contract when firms are now uncertain about their exact types. Assume that a firm that does not go will be rated (out-of-equilibrium) by the market at 0 (or equivalently, the market thinks that $\mu = -\theta$). If a firm goes, and the rating reveals $v$, the intermediary charges $v$. In both cases, all types of firms get zero and they all go. Therefore the intermediary’s profit remains maximum at $1/2 - c$.

The bottomline of this section is then the following: when the intermediary is a monopolist, all firms get rated and all ratings are revealed. To do so, the intermediary implements some
cross-subsidization between firms since it makes a loss on low quality firms. Indeed, for such firms, the expected return from providing a rating is lower than the cost of exerting expertise. The rating market could not work better from the viewpoint of information revelation, taking as given the distribution of firms’ quality. Therefore, if one is sufficiently confident that market forces will lead to the intermediary getting ownership of the rating and to renegotiation taking place, then one should see no need for regulatory intervention. This conclusion should however be toned down: firms have no incentives to improve their governance, as their equilibrium payoff is independent of $v$.

4 Competing Intermediaries

In the previous section we have shown that the business model currently used by Standard and Poor’s will never be optimal as long as Standard and Poor’s is in a monopoly situation. We now turn our attention to the opposite case of Bertrand competition: two intermediaries who can produce a perfectly revealing score at a cost $c$ compete on the rating market. Unsurprisingly, an equilibrium where the intermediary keeps full ownership of the rating and captures all the surplus as described in Propositions 1 and 2 cannot survive in a competing framework. Indeed, the standard Bertrand-like reasoning applies and one of the intermediaries will always lower his price to attract all firms willing to obtain a score. This is summarized in the following lemma:

Lemma 4 When two identical intermediaries compete in contracts, they price at marginal cost and make zero profit.

Proof.
Assume that one intermediary offers a contract $\{p_0, p(v), d(v)\}$ that generates strictly positive profits. Then the other intermediary say $j$, could adopt the same disclosure structure $d(v)$ and slightly undercut prices. By doing so, intermediary $je$ would attract all firms. Therefore, whatever the contractual offers, intermediaries’ expected profits have to be zero in equilibrium.

Now let us show that firms profits per type also have to be zero. To the contrary suppose that, at equilibrium there exist an intermediary and a type $\tilde{v}_2$ to whom this intermediary offers a combination of an access price $p_0$ and a price contingent of quality $p(\tilde{v}_2)$ so that $p_0 + p(\tilde{v}_2) > c$. Given that, in expectation, intermediaries have to make zero profit, there must exist at least one type $\tilde{v}_1$ such that $p_0 + p(\tilde{v}_1) < c$. Then the other intermediary can offer $p_0 + p(\tilde{v}_1) + \varepsilon$ to $\tilde{v}_1$, and lose that client for sure.
and \( p_0 + p(\tilde{v}_2) - \varepsilon > c \) and get that client for sure. Both moves increase profits strictly above zero. Therefore this cannot be part of an equilibrium and necessarily \( p_0 + p(v) = c \) \( \forall v \).

Lemma 4 pins down the price structure compatible with an equilibrium but remains silent about the other contractual variables: ownership structure and disclosure policy. We are able to narrow down our search for the circumstances under which hiding a rating may be part of an equilibrium by noticing that:

**Lemma 5** If intermediary \( i \) reveals that a given firm has hired its services (public contracting), then whatever the outcome of the rating, it is revealed: \( \forall i, v, d_i(v) = 1 \).

**Proof.**

Call \( V_i \subset [0,1] \) the set of types who hire intermediary \( i \) and \( \bar{v}_i := \inf V_i \) the lowest of those types. Suppose that there exists some subset \( \bar{V}_i \subset V_i \) of ratings that are not revealed \( (d_i(v) < 1 \text{ for } v \in \bar{V}_i) \).

Now, define \( \bar{v}_i := \sup \bar{V}_i \). If the intermediary faces \( \bar{v}_i \), it is optimal to renegotiate the disclosure policy and set \( d(\bar{v}_i) = 1 \), since \( \bar{v}_i > E[v/v \in \bar{V}_i] \). This argument unravels and all types are revealed.

The proof of Lemma 5 does not assume any particular form of the contract offered by intermediary \( j \neq i \). It only uses the simple intuition that once a firm is seen to have hired an intermediary but that no rating is revealed, it must be bad news, regardless of the choice of intermediary. An important implication is then that there cannot be an equilibrium where firms hire intermediaries but do not reveal ratings unless some of those hiring contracts are kept secret. We now explore this possibility, while successively considering settings where the firm is perfectly and imperfectly informed of its own type.

### 4.1 Fully Informed Firm

In this subsection, we study the case where \( \theta = 0 \) and we limit ourselves to secret contracting as we know that this is a necessary feature for the option to hide a rating to be of some value. Because the firm knows exactly its value \( v \), the willingness to pay of any type who hires intermediary \( i \) is then:

\[
d_i(v)v + (1 - d_i(v))E[v/\phi] - E[v/\phi]
\]

as the hiring decision is secret. Therefore the firm’s willingness to pay is maximum for either \( d_i(v) = 1 \) or \( d_i(v) = 0 \). But as firms are informed on \( v \), they know exactly their maximum willingness to pay. In particular, a firm for which \( v < E[v/\phi] \) in a given putative equilibrium
is better off not hiring any intermediary: indeed the same information will be revealed to the market but it will save the fee (at least equal to $c$). So, intermediaries can restrict their offers to firms with types $v \geq E[v/\phi]$ and for which $d_i(v) = 1$.

It then follows that:

**Proposition 5** When $\theta = 0$, the unique equilibrium under Bertrand competition is that each intermediary chooses $d_i(v) = 1$ and $p_0 = c$ and $p(v) = 0$. Firms ask for certification, and reveal their ratings if and only if $v \geq 2c$.

**Proof.**
Existence follows from previous arguments and the fact that if intermediary $i$ offers $p_0 = c$ and $p(v) = 0$ with full disclosure, intermediary $j$ can only attract clients by offering the same contract. Therefore there exists a type $\hat{v}$ who is indifferent between asking or not for certification that satisfies the following indifference condition:

$$E_v[v/v \leq \hat{v}] = \hat{v} - c$$

which is equivalent to $\hat{v} = 2c$.

Unicity stems from the fact that any other contract must offer the same price of $c$ and that $d_i(v) = 1$ maximizes firms’ willingness to pay.

The last proposition has simple implications for the ownership of ratings. First, it is implementable by a simple sale of ownership of ratings to the firms for a fixed price of $c$. Such a contract would be equivalent to a contract that ex ante specifies full disclosure. Similarly a form of “joint-ownership” by the firm and the intermediary whereby it is enough that one of the two parties decides to reveal the rating for it to be revealed would also implement the same outcome. The only form of ownership that is incompatible with this equilibrium is in fact intermediary’s ownership. If only the intermediary had the right to reveal a rating, it would create a potential hold up problem ex post: regardless of ex ante competition, once the rating is produced the intermediary could threaten the firm not to reveal it. This threat would allow the intermediary to extract an additional fee of $v - E_v[v/v \leq \hat{v}] > 0$. Therefore an intermediary that would offer such a contract would attract no clients.

To some extent, the last proposition rationalises the use of contractually transferring the ratings’ ownership to firms: it is one of the ways to implement the optimal contract. But still it does not square with the evidence compiled by S&P, namely the fact that most of the firms actually do not reveal their rating.
4.2 Firm’s Imperfect Knowledge and the Value of Secret Contracting

Assume now that at the time of hiring the intermediary, the firm is not perfectly informed of its true value: the firm only knows $\mu \in [v - \theta, v + \theta]$ with $0 < \theta < \frac{1}{2}$. To limit the number of cases in our analysis we also impose the parametric restriction that $c \in [0, \frac{1}{6}]$. Our objective is to show that firms’ ownership of ratings with some of those ratings being hidden can now emerge in equilibrium. It is enough for us to establish this result for those values of parameters (the discussion in the sequel will make clear why those restrictions matter).

Introducing some uncertainty in the firms’ valuations has two consequences. The obvious one is that the firm is unsure ex ante whether once a rating will be produced, it will be in its best interest to reveal it. The second and less obvious consequence is that the signal associated with the absence of a rating is less informative than when $\theta = 0$. A firm may not have a rating because it hired an intermediary but chose not to reveal it or because it did not go to the intermediary. This last possibility may not say much about the true firm’s value as such a decision was taken not knowing exactly what the true firm’s value was. Our analysis below shows the relevance of this second effect.

Lemma 6 Any equilibrium is a threshold equilibrium in which there exist some values $\hat{\mu}$ and $\hat{v}$ so that: a firm asks for a rating if and only if $\mu \geq \hat{\mu}$. Moreover, if the probability of not revealing the score is strictly positive, it must be that a firm reveals its score, $v$, if and only if $v \geq \hat{v}$.

Proof.
Again, suppose that there is an equilibrium in which the firm does not go to the intermediary if and only if $\mu \in M_1 \subset M$. Moreover, for those firms that have asked for a score, if $v \in V_1$ the firm reveals the score and if $v \in V_2$ the firm does not reveal the score. Define

$$\phi = \{ (\mu, v) : [\mu \in M_1 \text{ or } [\mu \in M_2 \text{ and } v \in V_2] \},$$

the set of signals and scores such that no score is revealed. So, if no score is revealed buyers are willing to pay $E_v[v|(\mu, v) \in \phi] = E_v[v|\phi]$. For this to be an equilibrium we need:

$$E_v[v|\phi] \geq Pr(v \in V_1 | \mu) E_v[v|v \in V_1, \mu] + Pr(v \in V_2 | \mu) E_v[v|\phi] - c \quad \forall \mu \in M_1,$n$$

$$E_v[v|\phi] \leq Pr(v \in V_1 | \mu) E_v[v|v \in V_1, \mu] + Pr(v \in V_2 | \mu) E_v[v|\phi] - c \quad \forall \mu \in M_2.$$

Now $Pr(v \in V_2 | \mu) = 1 - Pr(v \in V_1 | \mu)$, so the above conditions can be rewritten as:

$$c \geq Pr(v \in V_1 | \mu) (E_v[v|v \in V_1, \mu] - E_v[v|\phi]) \quad \forall \mu \in M_1,$$n$$

$$c \leq Pr(v \in V_1 | \mu) (E_v[v|v \in V_1, \mu] - E_v[v|\phi]) \quad \forall \mu \in M_2.$$
Since $\Pr(v \in V_1 | \mu) (E_v[v | v \in V_1, \mu] - E_v[v | \phi])$ is an increasing function of $\mu$, this means that there is a $\hat{\mu}$ defined as $\Pr(v \in V_1 | \hat{\mu}) (E_v[v | v \in V_1, \hat{\mu}] - E_v[v | \phi]) = c$ such that all $\mu < \hat{\mu}$ are in $M_1$ and all $\mu > \hat{\mu}$ are in $M_2$.

Finally, we need that once a firm in $M_2$ has asked for the score, it wants to reveal it if and only if $v \in V_1$. That is

$$E_v[v | \phi] \leq v \quad \forall v \in V_1,$$

$$E_v[v | \phi] \geq v \quad \forall v \in V_2.$$

These two conditions together imply that either $V_2 = \emptyset$ or there must be a type $\hat{v} = E_v[v | \phi]$, such that all $v < \hat{v}$ are in $V_2$ and all $v > \hat{v}$ are in $V_1$.

It is illustrative at this stage to introduce the willingness to pay of a firm informed of $\mu$. As contracting must be secret, if it hires intermediary $i$, the firm expects:

$$E_v[(d_i(v) v + (1 - d_i(v)) E_v(v/\phi)] / \mu$$

while it would get $E_v(v | \phi)$ if it did not hire the intermediary. Therefore the willingness to pay is:

$$E_v[(d_i(v)(v - E_v(v/\phi)]) / \mu$$

We observe that to maximise this willingness to pay, competing intermediaries should choose $d_i(v) = 1$ if $v \geq E_v(v/\phi)$ and 0 otherwise. The fact that now $d_i(v) = 0$ may help maximise the firm’s ex ante willingness to pay reflects the first effect we mention before: the firm may prefer ex post to hide the rating. But for this is to be more than a theoretical possibility we need to exhibit an equilibrium where there exists some $\mu \geq \hat{\mu}$ for which the set of attainable values of $v$ contains some range for which $v < E_v(v/\phi)$. This last is itself endogenous.

Consider a putative symmetric equilibrium where both intermediaries offer the same contract. Suppose that firms with $\mu \geq \hat{\mu}$ ask for certification while others don’t. A firm that asks and obtains a rating $v$ can either reveal it and get $v$ or withhold it and get:

$$E_v(v | \phi) = E_v(v/\mu \leq \hat{\mu} \text{ or } \mu \geq \hat{\mu} \text{ and } v \leq \hat{v})$$

where $\hat{v}$ is the type which ex post is just indifferent between revealing $\hat{v}$ or nothing, $\hat{v} = E_v(v/\phi)$.

To simplify notation in what follows, call $\underline{v} = \max\{\hat{v}, \hat{\mu} - \theta\}$ the lowest score that gets revealed and $\overline{v} = \min\{1, \hat{\mu} + \theta\}$ the highest score that a type $\hat{\mu}$ can obtain.
The intermediaries make zero profits in equilibrium, so according to Lemma 6, \( \hat{\mu} \) is defined by

\[
c = \Pr(v > v|\hat{\mu}) \left( E_v[v|v > v, \hat{\mu}] - E_v(v|\phi) \right).
\]

Using the results above, we also get that,

\[
\Pr(\phi) = \int_0^v \int_{v-\theta}^{v+\theta} \frac{1}{2\theta} d\mu dv + \int_0^\hat{v} \int_{v-\theta}^{v+\theta} \frac{1}{2\theta} d\mu dv,
\]

\[
\hat{v} = E_v(v|\phi) = \frac{1}{\Pr(\phi)} \left[ \int_0^v \int_{v-\theta}^{v+\theta} \frac{v}{2\theta} d\mu dv + \int_0^{\hat{v}} \int_{v-\theta}^{\hat{v}} \frac{v}{2\theta} d\mu dv \right].
\]

Rewriting this expression using that \( E(v|v > v, \hat{\mu}) = \frac{v + \hat{\mu}}{2} \) and \( \Pr(v > v|\hat{\mu}) = (v - v) f(v|\hat{\mu}) \), we get that \((\hat{v}, \hat{\mu})\) are obtained by solving equations (2) and (3). We are now equipped to provide the following result.

**Proposition 6** If \( \theta > c \), transferring property rights to the firm is a profitable deviation. Otherwise, the equivalence principle applies.

**Proof.**

Suppose that, under the deviation the agent that is indifferent between asking or not for a rating remains the same so that the type indifferent between asking for a rating or not remains identical for the two intermediaries.\(^5\) Transferring the ownership to firms provides an insurance to this firm protecting her from low realization of the signal. Therefore, any time a subset of firms asking for a rating but withhold it is not empty (formally \( \hat{v} > \max\{0, \hat{\mu} - \theta\} \)), the price such firm is ready to pay for the rating increases.

It therefore remains to show whether such subset of firms is none empty. Formally, it boils down to check whether one can get, under such deviation, that \( E_v(v|\phi) > \max\{0, \hat{\mu} - \theta\} \).

From the proof of Proposition ???, the only candidate for an equilibrium with full revelation of information is

\[
\hat{\mu} = \begin{cases} 
6c - \theta & \text{if } \frac{\theta}{3} < c \\
\frac{c}{\sqrt{c^2 + \frac{\theta^2}{3}}} & \text{if } \frac{\theta}{3} \geq c.
\end{cases}
\]

Take first the case \( \frac{\theta}{3} < c \), or \( \hat{\mu} = 6c - \theta \). From equation (3), we get

\[
\hat{\mu} = \hat{v} - \theta + (6\theta)^{\frac{1}{2}} \hat{v}^{\frac{3}{2}}.
\]

Plugging these two equations together, we get

\[
6c = \hat{v} + (6\theta)^{\frac{1}{2}} \hat{v}^{\frac{3}{2}}
\]

\(^5\)The intermediary can always increase his price such that the same agents remains indifferent. If he does not, it entails a larger profit for the intermediary.
from which, obviously, \( \hat{v} > 0 \). Therefore \( \hat{v} > 0 > \hat{\mu} - \theta \), and a positive fraction of firms ask for a rating but do not disclose it. Therefore, transferring all property rights to the firm is strictly profitable.

Consider now the case where \( \frac{\theta}{6} < c < \frac{1}{6} \) or, \( \hat{\mu} = c + \sqrt{c^2 + \frac{1}{3} \theta^2} \).

Using again equation (3), we get \( \hat{\mu} = \hat{v} - \theta + (6 \theta)^{\frac{1}{3}} \hat{v}^{\frac{2}{3}} \), or

\[
c + \sqrt{c^2 + \frac{1}{3} \theta^2} = \hat{v} - \theta + (6 \theta)^{\frac{1}{3}} \hat{v}^{\frac{2}{3}}.
\]

(5)

The right-hand-side of (5) is an increasing function of \( \hat{v} \). Therefore \( \hat{v} > \hat{\mu} - \theta \) if and only if the left-hand side of (5) is greater than the right-hand-side evaluated at \( \hat{v} = \hat{\mu} - \theta \). This gives

\[
2\theta > (6 \theta)^{\frac{1}{3}} \left[ c + \sqrt{c^2 + \frac{1}{3} \theta^2} - \theta \right]^{\frac{2}{3}},
\]

or

\[
\theta > c.
\]

Therefore, whenever \( \theta > c \), the deviation is profitable.

We have shown that when the firm is poorly informed about her own type there is no equilibrium in which all scores are revealed. Indeed, any intermediary prefers to keep contracting secret and transfer property rights to the firm. By doing this, they insure the firm against bad scores. Indeed, secret contracting allows a firm who gets a low rating to hide behind a firm with a low signal (below \( \hat{\mu} \)), but whose true value may be high because \( \theta \) is large. It remains to show that transferring property rights to the firm is an equilibrium for \( \theta \) large.

**Proposition 7** If \( \theta > c \) there is a unique equilibrium in which both intermediaries charge a price equal to \( c \), keep contracting secret and transfer property rights to the firm.

**Proof.**

Available from the authors.

The unravelling result breaks down when we introduce secret contracting and firms have noisy information about their types. It is interesting to note that this happens when the rating industry is more valuable: it is not very costly (\( c \) is low) and it considerably improves the information available (\( \theta \) is large).
References


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5 Appendix 1

We derive the optimal policy of the monopolist for any distribution of types. The profit function is

$$\max_{\hat{v}} \int_{\hat{v}}^{1} \left[ v - E[ v / v \leq \hat{v} ] - c \right] dF(v)$$

Denote by $g(\hat{v}) = E[ v / v \leq \hat{v} ]$, $g'(\hat{v}) = \frac{f(\hat{v})}{F(\hat{v})} [ \hat{v} - g(\hat{v}) ]$. The first order condition for an interior solution is

$$- (\hat{v} - g(\hat{v}) - c) f(\hat{v}) - (1 - F(\hat{v})) g'(\hat{v}) = 0$$

$$- (\hat{v} - g(\hat{v}) - c) f(\hat{v}) - (1 - F(\hat{v})) g'(\hat{v}) = 0$$

$$\Leftrightarrow -\hat{v} + g(\hat{v}) + c - \frac{1 - F(\hat{v})}{F(\hat{v})} [ \hat{v} - g(\hat{v}) ] = 0$$

$$\Leftrightarrow (-\hat{v} + g(\hat{v})) \left( 1 + \frac{1 - F(\hat{v})}{F(\hat{v})} \right) + c = 0$$

$$\Leftrightarrow (-\hat{v} + g(\hat{v})) + cF(\hat{v}) = 0$$

The first term is negative for any $\hat{v} > 0$. In the case of uniform distribution, the left hand side of the last equation reduces to $\hat{v}(c - \frac{1}{2})$, which is always negative as $c < 1/2$. More generally, the optimal policy could involve a strictly interior threshold, although one would also need to check for a (local) maximum to exist that:

$$\Leftrightarrow -1 + g'(\hat{v}) + cf(\hat{v}) \leq 0$$

This last condition is not satisfied in many simple examples. For instance, if one takes the distribution of firms’ updated value when they only receive a signal $\mu$, uniform on $[v - \theta, v + \theta]$ and that $v$ itself is uniform on $[0, 1]$ (as is the case in Appendix 2), the profit function is not globally concave. However, for any distribution that satisfies $E(v) = 1/2$ and $E[ v / v \leq \hat{v} ] \geq \hat{v}/2$ for all $\hat{v}$ (for instance an increasing density function would offer this property), we can show the following: at any point $\hat{v}^*$ for which $\Pi'(\hat{v}^*) = 0$ it must be that $\Pi(\hat{v}^*) \leq \frac{1}{2} - c$. Indeed at such points, we would have $cF(\hat{v}^*) = \hat{v}^* - g(\hat{v}^*)$. The profit function satisfies for any $\hat{v}$,

$$\int_{\hat{v}}^{1} [ v - g(\hat{v}) - c ] dF(v) = \int_{0}^{1} [ v - g(\hat{v}) - c ] dF(v) - \int_{0}^{\hat{v}} [ v - g(\hat{v}) - c ] dF(v)$$

$$= \frac{1}{2} - g(\hat{v}) - c - \int_{0}^{\hat{v}} v dF(v) + F(\hat{v}) (g(\hat{v}) + c)$$

$$= \frac{1}{2} - g(\hat{v}) - c + F(\hat{v}) c$$

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so that
\[ \Pi(\hat{v}^*) \leq \frac{1}{2} - c \Leftrightarrow cF(\hat{v}^*) \leq g(\hat{v}^*) \]

but at an interior point, this inequality simplifies to
\[ \hat{v}^* - g(\hat{v}^*) \leq g(\hat{v}^*) \]

so that, if for any \( \hat{v} \), \( g(\hat{v}) = E[v/v \leq \hat{v}] \geq \hat{v}/2 \), this condition is satisfied. For instance, any distribution centered on \([0,1]\) which is dominated by the uniform distribution in the sense of first order stochastic dominance (i.e. \( F(v) \leq v \)) satisfies this inequality.

6 Appendix 2

In the monopoly case without upfront payment, the intermediary can only charge firms that do not exert the option. Indeed, whenever exerting the option of withholding the rating a firm expects \( E[v/\phi] \) which corresponds exactly to its outside option of not asking for a rating. The decision whether to attract all firms or only a subset is then independent of the possibility to offer such option.

Suppose now that the firm is asked to pay an upfront payment \( p_0(\mu) \) and a transfer contingent of true quality \( p_\mu(v) \). Assume first that the intermediary offers a menu of contracts such that each firm self-selects on a different contract. The intermediary will leave her, in expectation, no rent. Firm \( \mu \)'s participation constraint is given by
\[
\int_0^1 (d(v) (v - E[v/\phi]) - p_\mu(v) f(v|\mu)) dv = E[v/\phi]
\]

which can be rewritten
\[
\int_0^1 (d(v) (v - E[v/\phi]) - p_\mu(v)) f(v|\mu) dv = p_0(\mu). \tag{6}
\]

The intermediary can then derive a profit of
\[
\pi = \int_{\hat{\mu}}^{1+\theta} \left[ p_0(\mu) + \int_0^1 p_\mu(v) f(v|\mu) dv \right] \frac{f(\mu)}{1 - F(\hat{\mu})} d\mu - c(1 - F(\hat{\mu})).
\]

Using equation (6), this can be rewritten
\[
\pi = \int_{\hat{\mu}}^{1+\theta} \int_0^1 (d(v) (v - E[v/\phi]) f(v|\mu) dv) \frac{f(\mu)}{1 - F(\hat{\mu})} d\mu - c(1 - F(\hat{\mu})).
\]
This is equivalent to a setting where the intermediary charges only firms that do not exert
the option. Therefore the ability not to exert the option has no impact on the profit of the
intermediary.

Suppose now that some firms pool on the same contract. This entails that the intermediary
leaves some rent to firms which cannot be optimal.

The question then remains to investigate whether the intermediary is willing to attract all
firms or to leave a subset out of the certification market when the option has no value. This
is the aim of what follows.

Suppose now that the rating agency does not offer the option to withhold the rating. We show
that the monopolist’s profit when the firms’ information is \( \mu \) with \( \mu \) uniform on \([v - \theta, v + \theta]\)
and \( v \) uniform on \([0, 1]\) cannot exceed \( 1/2 - c \).

Simple Bayesian updating gives the density of \( \mu \),

\[
f(\mu) = \int_0^1 f(\mu|v)f(v)dv = \begin{cases} \frac{\mu+\theta}{2\theta} & \text{if } \mu \in [-\theta, \theta) \\ 1 & \text{if } \mu \in [\theta, 1-\theta] \\ \frac{1+\theta-\mu}{2\theta} & \text{if } \mu \in (1-\theta, 1+\theta] \end{cases}
\]

Define now \( x(\mu) = \int_0^1 vf(v/\mu)dv \). We have

\[
x(\mu) = \int_0^1 vf(v/\mu)dv = \begin{cases} \frac{\mu+\theta}{\theta} & \text{if } \mu \in [-\theta, \theta) \\ \mu & \text{if } \mu \in [\theta, 1-\theta] \\ \frac{1+\theta+\mu}{2\theta} & \text{if } \mu \in (1-\theta, 1+\theta] \end{cases}
\]

We can then deduce \( h(\tilde{x}) \) the firms’ ex ante distribution of valuations, where \( \tilde{x} \) denotes a
particular realization of \( x \): \( h(\tilde{x}) = (x^{-1}(\tilde{x}))'f(x^{-1}(\tilde{x})) \).

\[
h(\tilde{x}) = \begin{cases} \frac{2\tilde{x}}{\theta} & \text{if } \tilde{x} \in [0, \theta) \\ 1 & \text{if } \tilde{x} \in [\theta, 1-\theta] \\ \frac{2(1-\tilde{x})}{\theta} & \text{if } \tilde{x} \in (1-\theta, 1] \end{cases}
\]

and

\[
\text{Prob}(\tilde{x} \leq \hat{v}) = \begin{cases} \frac{\hat{v}^2}{\theta} & \text{if } \hat{v} \in [0, \theta) \\ \hat{v} & \text{if } \hat{v} \in [\theta, 1-\theta] \\ 1 - \frac{1}{\theta} + \frac{2\hat{v}}{\theta} \left(1 - \frac{\hat{v}}{2}\right) & \text{if } \hat{v} \in (1-\theta, 1] \end{cases}
\]

It is a simple exercise to check that for this distribution, \( E[v/v \leq \hat{v}] \geq \hat{v}/2 \).

Given that the intermediary can indeed get a profit of \( \frac{1}{2} - c \) by attracting all firms, doing so
is indeed an equilibrium strategy.