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What if I knew you did it? An Analysis of Preliminary Ratings' Disclosure under Competition

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Abstract

This paper investigates an amendment to the European Regulation mandating the disclosure of the contact between credit rating agencies (CRAs) and entrepreneurs. If it is costly for the CRAs to become informed, the equilibrium is unique and mandatory disclosure has no effect. When the effort cost is low, disclosure affects negatively the first CRA's decision to become informed whereas the second CRA is less (more) likely to exert effort when reputation at the outset is low (high). With disclosure, each of the two CRAs can free ride on the other, making not exerting effort more profitable in the transparent regime.

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Introduction

In the wake of the financial crises, credit rating agencies (CRAs) have been questioned and the attention devoted to the credit rating industry has targeted market structure and lack of transparency as possible causes of bad functioning. The industry is an oligopoly, with the Big Three CRAs, namely Standard & Poor's, Moody's and Fitch, having a corporate bond market share above 90%. While competition exists, it is in niche markets such as rating of insurance companies or ratings of commercial mortgage-backed securities (MBS). In recent years, the only market in which a fourth CRA conspicuously expanded is the structured financial instruments (SFI) market, where DBRS is now regarded as large.[1] Legislators and regulatory bodies have been repeatedly calling for more competition and improved information disclosure, to the benefit of both issuers and especially investors.

I develop a model of informal reviews under competition and use it to investigate two disclosure regimes. The aim is to provide a framework to look at market structure and at transparency at the same time. I model a situation where the entrepreneur has the possibility to approach more than one CRA at a preliminary stage. I am interested in a competitive situation where the CRAs would like to gain reputation among a third party (i.e. investors) through the provision of a published certification but where competition occurs in the preliminary ratings market. This market has several peculiarities. First of all, CRAs compete in the issuance of preliminary ratings which have the characteristics of being provided confidentially to the entrepreneur. As a consequence these ratings are not directly relevant to the opinion that investors hold regarding the quality of the CRA. The CRAs however value the opinion of the market on their quality and need the entrepreneur to buy a final rating in order to make it publicly available. I consider two regimes, one in which disclosure is not in place and one in which disclosure of the contact between the CRA and the entrepreneur is mandatory.[2] These regimes reflect a recent amendment to the European Regulation on credit rating agencies which requires these experts to disclose any issuers' request of preliminary ratings.[3]

[1] According to Commission [2016], slight increases in market shares can be seen in corporate finance bonds (GBB in Germany), in corporate insurance (Assekurata in Germany and AM Best in Spain) and in corporate non financial (Axesor in Spain). These are increases in local markets which seem not to be replicated at the aggregate level.

[2] The same two regimes have been studied in Ronchetti [2018], where there was only one CRA.

[3] This requirement is disciplined in Point 6 of Part 1 of Section D of Annex 1 to Regulation (EC)

The CRA decides whether to exert effort at a cost in order to increase the accuracy of the preliminary evaluation and in turn the perception that the market has on its quality. There is no fee at the preliminary stage, only the final rating stage involves a cost for the entrepreneur. I assume that when the CRA is assessing the quality of the project only reputation matters. [4]

I ask to what extent an increase in transparency impacts on the incentive of the CRAs to exert effort when performing a preliminary evaluation. How does the behaviour of the CRA change as the information at the disposal of the investors becomes more precise?

When the disclosure of preliminary evaluations is not in place CRAs do not know whether the entrepreneur is approaching an expert for the first time.[5] Mandatory disclosure of any contact between the CRAs and the issuer leads to the CRA being better informed on the sequence of requests made by the entrepreneur. Moreover, informing investors about such contacts affects the incentive of the CRA through reputation.[6]

I find that mandatory disclosure when the cost of effort is high (which may happen for more complex financial products) has no effect; the CRAs exert no effort and the entrepreneur acts according to the magnitude of the ratio between the cost of contacting the second CRA and the fee. I show that when the effort cost is relatively low (which may happen for traditional debt instruments), disclosure decreases the space of parameters' combinations for which an informative equilibrium exists. Under disclosure there are two types of informative equilibrium, as opposed to one type under no disclosure. Either the effort is exerted only by the first CRA and the entrepreneur does not shop for ratings or the entrepreneur requests a second opinion and effort is exerted only by the second CRA. I find that the first CRA is less likely to exert effort whereas the second CRA is less (more) likely to exert effort when reputation at the outset is low (high). Disclosure dampens the incentives of the first CRA to exert effort while it provides the correct ones to the second CRA in certain situations.

No.1060/2009 as amended by Regulation (EU) No 462/2013.

[4]In Commission [2016] it is suggested that the reputation that CRAs enjoy among investors is crucial when they compete. I follow this view, abstracting from the major source of revenue of the CRAs. Thus in this paper the certification fee is non contingent on the outcome of the evaluation and is paid to a different division within the CRA.

[5]It might be the case that the uninformed party has already approached another CRA.

[6]Contact disclosure can be interpreted as partial information provided to investors. Partial because the actual outcome of the evaluation is only known to the entrepreneur and to the CRA.

When switching to a different CRA is not too costly and becoming informed does not require a high investment, I find an increase in the parameter space where the second CRA exerts effort. I also analyse what happens if contacting a second CRA is extremely expensive, removing competition.[7]. I find that moving from no disclosure to mandatory disclosure has two effects. When there are few good projects disclosure results in a weaker incentive to exert effort. When good projects are numerous, the incentive to invest in information is stronger. Overall this paper shows that, under the assumption that more information is beneficial, disclosure never results in more information in the system.

This work represents a step forward in investigating the effects of improved transparency on incentives when reputation is at stake. While preliminary ratings are a relatively new area of interest (Sangiorgi and Spatt [2017], Ronchetti [2018]), reputation, competition and information revelation have been investigated in relation with issues such as shopping for ratings, and rating inflation.

The practice of contacting several agencies in order to choose among the given evaluation the most favourable ones, known as shopping for rating, has been studied in models such as Skreta and Veldkamp [2009] where as the number of CRAs increases, the bias increases as well. I restrict attention to a limited possibility to shop for rating, whereby the entrepreneur can consult at most two CRAs for the preliminary evaluation at no cost. Faure-Grimaud et al. [2009] focuses on the optimal ownership contract between the CRA and a firm showing that competition in the rating markets should not be encouraged because it leads to less information conveyed in equilibrium. I find that when switching to a different CRA is not too costly (i.e fostering competition) and becoming informed does not require a high investment, the second CRA is more likely to exert effort. In Sangiorgi et al. [2009], notching can be an equilibrium outcome consistent with a purely competitive environment, nevertheless it may still be consistent with behaviours that go against competition.[8] Starting from the consideration that the informativeness of rating is affected by ratings shopping, Kronlund [2013] investigates to which extent bond issuers engage in such a practice. An interesting finding shows that delay in the publication of lower ratings until after a bond is issued, is a common practice. Hence not only a choice

[7]This corresponds to a situation where there is long term relationship between the parties such that approaching another CRA requires time and effort to provide the information needed.

[8]Notching is a practice that involves the reduction of a competitor's rating when reporting the rating on another scale;

is made regarding the CRA but also a choice in terms of timing takes place.

In the presence of rating shopping, competition has an effect on rating inflation. In Bolton et al. [2012] competing when shopping for rating is possible reduces market efficiency and CRAs are found to be more prone to inflate ratings during booms.[9] A similar conclusion of high likelihood to ratings' inflation under competition is reached by Camanho et al. [2012]; yet unlike the model by Bolton et al. [2012], here the authors do not address shopping for rating as one of the causes. Competition has a disciplining effect, which is said to decreases rating inflation trough incentives to maintain or to gain market leadership and a market sharing effect, which lowers the reward from maintaining reputation. According to Vasconcelos and Wang [2014] competition may reduce the efficiency of the service provided by the CRA. Rating inflation is an equilibrium outcome and truth telling gives rise to a lower surplus in duopoly than in monopoly. The suggestion of the authors is that the outcome of a regulation requiring the issuers to purchase a rating from both CRAs, avoiding contingency on content, would turn out to be better than an unregulated duopoly. I partially follow this idea by having non contingent fees in the model. Bongaerts et al. [2012] identify a different explanation than rating inflation when Fitch acts as a tiebreaker. If $S\&P$ and Moody's have different evaluations of a financial product, it is likely that the issuer solicits a rating from the third agency if he expects the evaluation to lean towards investment grade.

The empirical literature on competition in the rating industry gives divergent findings. Griffin et al. [2013] claim that encouraging competition may lower rating quality unless safeguards are put in place. They have two main points: one is that empirically $S\&P$ issues more positive AAA size adjustments when there is competitive pressure from Moody's. The other is that collateralized debt obligations (CDOs), which are a type of structured financial products, rated by both CRAs result in a default more often than those rated from just one CRA. An overall lower quality of ratings after the entry of a third player is found in Becker and Milbourn [2011] as well. The authors identify as a reason for competition affecting incumbent quality the fact that competitive pressure may force CRAs to decrease accuracy to meet the expectations of the issuers, in the short run, even though they should focus on the long run pursuing the goal of maintaining

[9] In Bar-Isaac and Shapiro [2013] lower ratings quality in booms and higher in recessions are suggested by many economic fundamentals.

reputation high among investors. Instead of ratings competition Bae et al. [2015] show that the effect of Fitch's market share on credit ratings issued by the other two CRAs can be driven by industry heterogeneity. By focusing on reputation and ignoring the fee I am abstracting from the short run considerations to solely investigate the long run ones. Xia [2014] investigates how information quality of ratings issued by an issuer-pay rating agency changes when an investor-pay rating agency enters the market. Unlike Becker and Milbourn [2011], here incumbent's ratings improve significantly and it is argued that increase in reputation concerns is one of the causes.

Competition has also been studied in relation to the CRAs reputation. The results from Lugo et al. [2014] seem to be consistent with the idea that a CRA with a low reputation is the most influenciable and the least influencing among rival CRAs, whereas the more reputable ones influence each other symmetrically. By Considering Fitch to have the lowest reputation, they find that Moody's and $S\&P$ react quicker to a downgrade issued by the other compared to the case of Fitch being the first to downgrade. Bizzotto [2014] shows that if reputation incentives for the CRAs are weak, competition among them results in the issuer investing more in the security's quality to the benefit of the market. In the rating industry the revelation of information can be affected by competition. When the CRA aims at maximising its reputation with respect to that of the competitors for market power reasons, Mariano [2012] finds that reputation concerns do not guarantee that the rating is accurate. This happens because public information gets contradicted from the CRA just because of the reputation gain if it is proved to be right. Good ratings are issued more often in order to avoid the possibility of a second rating.[10] In Doherty et al. [2012] full disclosure is not optimal and a second rating (i.e competition) is worth only if it allows the seller to signal his higher quality. Their empirical analysis of the market for insurance ratings shows that those who decided to purchase a second rating were of higher financial quality; nonetheless the average rating was either the same or even lower than that assigned by the incumbent. In Lizzeri [1999] oligopolistic competition among intermediaries leads to an equilibrium with no profits and full information. In S.Hirth [2014] the interaction studied is that between the CRAs and investors. Pure strategy outcomes show that either honest or inflating CRAs dominate and that the investors are either trusting or sophisticated. In my model investors are non strategic and only

[10]Under full disclosure the rating is a perfect signal of the seller's quality

update beliefs on the CRAs' type, while the studied interaction is that between the CRAs and the entrepreneur. Manso [2013] investigates feedback effects on the credit quality of issuers, showing that a downward pressure on ratings can be due to increased competition among CRAs. The focus in Cohen and Manuszak [2013] is on the effect of competition on ratings using the market for commercial mortgage-backed securities (CMBS).[11] The main implication of the findings identified by the authors states that as a new CRA reaches a market share similar to that of the incumbent CRAs, competition may worsen. This paper as many others uses the rise of Fitch to empirically investigate competition questions.

Looking at sovereign ratings, Gomes [2013] shows that having more CRA does not increase the monitoring. CRAs put weight on the competitors rating so as to increase the precision of their own rating. It is shown that the incentive to rely on the analysis performed by others is present.

To some extent this paper relates to the literature stream focusing on the consequences of information disclosure. For instance Kurlat and Veldkamp [2015] investigate the recent requirement for issuers to disclose relevant payoff information to the benefit of investors. They show that if uncertainty in payoffs is reduced by means of additional information disclosure, risk is lower which in turn reduces returns because these are meant to compensate for the risk taken. I focus on a different requirement and instead of holding the entrepreneur's behaviour fixed I hold that of the investors. In Mählmann [2008], the author analyses the economic role of rating publication rights showing that in the absence of an obligation to request a public rating, investors can't be sure about the reason for non disclosure, thus an an equilibrium with non disclosure of low quality ratings can occur. Jorion et al. considers Regulation Fair Disclosure and investigates how the implementation of the regulation changed the information content of rating announcements.[12] They find that downgrades (upgrades) cause larger falls (increases) in stock prices with respect to the pre-regulation period. Strausz [2005] shows that a certifier charges a fee above the monopoly price under full disclosure when he aims at credibility.

This work is also related to articles on expert second opinions such as Pesendorfer and Wolinsky [2003] that find that competition can lead to information free riding for the

[11] CMBS are structured debt instruments composed of commercial mortgages.

[12] The Regulation Fair Disclosure is a U.S. transparency regulation implemented to deal with selective disclosure. CRAs were granted an exemption to this regulation.

experts, resulting in weaker experts' incentives or procurement problems Wolinsky [2005] showing intensive search on the buyer's side and little effort on the sellers' side. The reminder of this article is as follows: Section 2 is devoted to the model general set up. Section 3 deals with the equilibrium analysis focusing on (i) the model without disclosure and (ii) the model with contact disclosure. Section 4 compares the two disclosure regimes and Section 5 considers what happens in the absence of competition.

1 The model

This section presents a model with an entrepreneur, investors and CRAs. The entrepreneur needs funding for a project. He approaches a CRA to have the project evaluated because investors rely on the published rating to make investment decisions. The CRAs operate in two stages. In the preliminary rating stage, they provide a preliminary evaluation which is confidential. In the final rating stage, upon payment of a fee, they provide a published rating. The CRA can either issue an investment grade final rating or a junk final rating. The entrepreneur goes to a CRA and asks for a preliminary evaluation after which he can approach at a cost a second CRA. The outcome of this interaction determines the access to funding for the entrepreneur and the reputation of the CRA. I consider two different regimes, one in which disclosure is not mandatory and one in which disclosure is mandatory. Details on the disclosure requirements are provided later.

1.1 The Entrepreneur

The entrepreneur has a project of type $\omega \in \{g, b\}$ which is good (g) with probability α and bad (b) with probability $(1 - \alpha)$. A good project always succeeds while a bad one always fails. The entrepreneur is unaware of the quality of the project and needs the CRA to certify the quality of the project. Only project which are reported to be investment grade access funding.

The entrepreneur has potentially two decisions to make; first he chooses whether to buy the report from the first CRA, contact a second one or stop and remain unrated. If a second CRA is contacted, he decides whether to buy the final report from the first CRA, from the second CRA or remain unrated. Buying the final rating involves a cost Φ to be

paid to the chosen CRA.[13] Contacting a second CRA involves a costs δ.

Assumption 1. $0 < \delta < \Phi$

Asking a second opinion is less expensive than purchasing the final report. The cost of approaching a second CRA can be justified as the amount of time forgone to obtain a second opinion.[14] After the entrepreneur receives the preliminary rating $P \in \{G, B\}$ from the first CRA, he decides whether to pay the fee for the final rating. I denote this strategic decision $y_P \in Y = \{0, 1\}$. Similarly after receiving the second preliminary rating, the entrepreneur decides whether to buy the final from the second CRA. I denote this strategic decision $z_{PP} \in Z = \{0, 1\}$. I assume that the final rating stage reveals the true quality of the project with certainty. If after receiving the two preliminaries the entrepreneur decides to buy, he is indifferent between paying the first or the second CRA because both give him the same outcome. Thus I assume that he pays the last which gave its opinion.

Definition 1. *The entrepreneur shops for ratings when he asks for a second opinion ($y_G = 0$) and he doesn't otherwise ($y_G = 1$).*

1.2 The Investors

Investors form beliefs on the quality of the CRA by means of the observed published rating, if available. They consequently fund the project whenever an *investment grade* rating (IG) is publicly available and do not provide funding if the project is rated *junk* (J).[15] In the no disclosure model, there is no evidence of the preliminary contact between either of the approached CRAs and the entrepreneur whereas the second model makes the disclosure of the contact mandatory.

[13] Final here refers to the non confidential nature of this rating. Once the entrepreneur decides to pay for the rating, the outcome of the evaluation becomes official. The fee is exogenous and can take any positive value.

[14] Another way of thinking of the cost is in terms of a switch cost. Going to another CRA imposes a burden on the entrepreneur.

[15] Investors belief over CRA's type is assumed to be irrelevant for investment decisions but only relevant for the CRAs when choosing how to behave.

1.3 The Credit Rating Agencies

The certification happens as follows: upon asking the first CRA for a preliminary evaluation the entrepreneur receives a verbal message. He can then approach a second CRA to obtain a second verbal message. Each CRA contacted provides a preliminary rating $P \in \{G, B\}$.

There is a large number of CRAs which can offer an informal review of the quality of the project. Each CRA can be of the *informed* (I) or *uninformed* (U) type. A CRA is informed with probability λ and uninformed with probability $(1 - \lambda)$. An informed CRA is always correct in its preliminary assessment of the quality of a project, whereas an uninformed one is correct only if an investment in information occurs. CRA's type is private information.

The uninformed CRA, after exerting effort, receives a signal $\theta \in \{g, b\}$ on the quality of the project. The informed CRA correctly assesses the project at the preliminary stage, namely

$$Pr(\theta = g|\omega = g, I) = Pr(\theta = b|\omega = b, I) = 1$$

In other words the informed CRA is committed to play the strategy consisting of always giving good (bad) preliminary rating to a good (bad) project.[16]
There is then an final rating stage which produces a published report $r \in \{IG, J\}$.[17] I assume that the fee charged for the final rating is paid to a different division within the CRA, thus when the CRA is assessing the quality of the project it only cares about its reputation.[18] There is private information in the final rating stage (which occurs after having seen the preliminary and after the purchase of the rating) revealing the true quality of the project with certainty. The final rating the entrepreneur receives is correct.

Once the CRA has exerted effort and has received a signal, she follows the signal and

[16]The use of a committed type in modelling reputation is a common practice which dates back to Kreps and Wilson [1982]. Such a tool has been often followed also in the CRA literature (Mathis et al. [2009], Camanho et al. [2012]), Bizzotto [2014].

[17]Recall that only projects receiving an investment grade rating (IG) access funding, those receiving a junk rating (J) are abandoned.

[18]Abstracting from the fee is a modelling tool which is justified by those policies and procedures put in place by CRAs in order to discern monetary compensation from the actual activity leading to the analysts' decisions and opinions. The exogeneity of the fee and its irrelevance for the CRA payoff provide an extreme framework where reputation becomes the only incentive for the CRA. The environment pictured in this paper is a duopoly, every CRA is aware that at most two of them will be contacted. Therefore the fee can be thought of as being competitively set.

reports a verbal message to the entrepreneur.[19]

1.3.1 Information Structure

The uninformed CRA knows its type and unlike the informed one it has to decide whether to exert effort $\eta \in \{0, 1\}$ in order to obtain the correct signal about the project's quality. Not exerting effort ($\eta = 0$) is costless whereas exerting effort ($\eta = 1$) involves a cost c. The cost function is simply $c\eta$, where $c > 0$. The choice of effort is unobservable to the other players and once the CRA decides on the effort, if the project is good the CRA receives a good signal $\theta = g$ with probability one:[20]

$$Pr(\theta = g|\omega = g, U) = 1$$

regardless of the chosen η. If the project is bad the CRA receives the correct signal $\theta = b$ with probability $\frac{1}{2} + \frac{\eta}{2}$ and the wrong signal with the complementary probability. This is the accuracy of the signal. More precisely, if the CRA chooses to exert effort

$$Pr(\theta = b|\omega = b, \eta = 1, U) = 1$$

$$Pr(\theta = g|\omega = b, \eta = 1, U) = 0$$

whereas if the CRA chooses not to exert effort

$$Pr(\theta = b|\omega = b, \eta = 0, U) = Pr(\theta = g|\omega = b, \eta = 0, U) = \frac{1}{2}$$

Definition 2. *The uninformed CRA is dutiful ($\eta = 1$) when she exerts effort and is lax otherwise ($\eta = 0$).*[21]

[19] The CRAs always report truthfully their signal. I abstract from the moral hazard problem arising from the possibility that the CRA misreports the signal. The rationale for this choice has to do with the decision to focus on the easiest situation and show that even in the absence of distortions, interesting behaviours can arise.

[20] No matter what level of effort the CRA beliefs to be optimal, any level the CRA may exert is sufficient to evaluate the project correctly when the state of the world is good.

[21] Even though the terms dutiful and lax have a behavioural connotation, here they just refer to the fact that the CRA by exerting effort performs her job properly whereas by not investing in information she acts loosely.

1.4 The Timing

The timing of the game is as follows:

1. Nature chooses state $\omega \in \{G, B\}$ and type of CRA and matches the entrepreneur with a CRA;
2. The CRA, if uninformed, decides on the level of effort to exert;
3. Nature chooses the signal $\theta \in \{g, b\}$;
4. The first CRA reports a verbal message $P \in \{G, B\}$;
5. The entrepreneur decides whether to stop, purchase the full report or contact another CRA. If the last happens, nature chooses the type of the CRA and matches it with a CRA;
6. The second CRA, if uninformed, decides on the level of effort to exert and checks the quality of the project and reports a verbal message $P \in \{G, B\}$;
7. The entrepreneur decides whether to stop or purchase the full report from the second CRA;
8. The CRA issues a rating $r \in \{IG, J\}$ which is published, investor invest and update their beliefs on the CRA's quality. Payoffs are realised.

2 Equilibrium Analysis

This section characterises the equilibrium. This is a dynamic game of incomplete information where the relevant equilibrium concept is Perfect Bayesian Equilibrium. This section is divided in two parts; subsection 2.1 is built on the assumption of no mandatory disclosure whereas subsection 2.2 deals with compulsory disclosure of the contact.

The choice of the regime has two main implications. On the one hand, when there is no evidence of a preliminary evaluation, the contacted CRAs don't know whether or not the entrepreneur has already approached another CRA. Hence, the first and the second CRA, when uninformed, behave in the same way. Conversely, when disclosure of the

contact is mandatory the CRAs know if they are the first or the second and therefore their behaviour can be different. On the other hand instead, moving from no disclosure to compulsory disclosure results in unrated projects becoming visible to the market. Thus, investors have more information to update their beliefs on the type of CRA. No matter in which regime the CRAs operate, if the CRA is informed, the behaviour will always be correct. For future reference, define two possible types of equilibria in the following way.

Definition 3. *An equilibrium is informative when at least one of the CRAs exerts effort and uninformative otherwise*

2.1 The model without disclosure

When disclosure is not mandated, there is no evidence of the entrepreneur approaching a CRA. The reputation of the CRAs in the case of an unrated project is unaffected. The posterior belief on the type of the CRA held by investors is equal to the prior.

Assumption 2. *Contacts for preliminary ratings are known only to the involved parties.*

The above means that only the CRA and the entrepreneur are aware of the request of a preliminary ratings, the investor instead doesn't see this happening.

2.1.1 Investors' Beliefs

Once a project rated investment grade is funded, the investors update beliefs on the quality of the rating agency. The accuracy of the final rating stage, results in either an investment grade rating which in turn allows to carry out the project or in a junk rating which results in the entrepreneur abandoning the project due to the impossibility of obtaining funding. Investors observe the outcome of the evaluation (if available) and following Bayes' rule update their beliefs. If they observe $r = IG$, their belief that the issuing CRA is of the informed type is

$$\mu_{IG} = \frac{\alpha[\lambda y_G + (1-\lambda)(1-y_G)\lambda + \lambda^2(1-y_G)]}{\alpha} = \lambda \tag{1}$$

where the denominator is the probability that an IG rating is published and the numerator is the probability that such a rating was due to an informed CRA. Similarly, if they observe

$r = J$, the probability that the CRA is of the informed type is

$$\mu_J = 0 \tag{2}$$

In other words, when a junk rating is published the market knows that the evaluation was due to an uninformed CRA. This happens because, even though the informed CRA would issue junk rating, in equilibrium this never happens as it will be explained in section 2.1.2. The idea is that a junk rating reveals the quality of the project to the entrepreneur with certainty ad therefore there is no incentive for him to purchase the official rating. This in turn implies that $r = J$ can only be the result of a $p = G$ preliminary rating which was wrong. Given the lack of evidence of the preliminary contact, whenever the rating from a certain CRA is not published, the CRA's reputation remains λ.

Assumption 3. *Without disclosure, the lack of a published a rating does not affect the belief of the investor that the CRA is informed with probability λ.*

The assumption above relies on the large number of CRAs at the outset. As a result, in the absence of pubic information when the entrepreneur decides to remain unrated, it is impossible to determine which CRA was contacted. Under this scenario the market rationally beliefs that each CRA still holds the same initial probability of being of the informed type.

2.1.2 Entrepreneur's Decision on Publishing or Remaining Unrated

Whenever the entrepreneur decides to ask for a second opinion, he will end up facing two evaluations which can be consistent or differ among themselves. The decision that the entrepreneur has to make involves a choice on whether to buy the final rating from the first CRA, buy from the second CRA or remain unrated. This boils down to the entrepreneur deciding between asking the second CRA for the final rating or not being publicly rated.[22]

[22] As explained previously, if the entrepreneur buys, he will do so from the second contacted CRA. Thus buying from the first CRA is ruled out by assumption. This assumption has no controversial effect on the results for three reasons: (i) The CRAs do not care about the fee by assumption and therefore paying the first or the second is indifferent for them (ii) in the light of Lemma 1, the entrepreneur purchases only if he receives $P = G$ twice, leading to the same reputation payoff for both experts (iii) without disclosure the CRAs behave as one. This implies that it doesn't matter that the entrepreneur never buys from the

Lemma 1. *After receiving the second rating the entrepreneur buys the final rating and pays Φ if and only if both preliminaries are good ($z_{GG} = 1$).*

Proof. After receiving two good preliminaries the entrepreneur purchases the final rating with probability one. Remaining unrated is not a valid strategy because if that were the case, the entrepreneur would be better off by stopping after the first preliminary evaluation thereby saving the cost of approaching a second CRA (δ). Since a good project is correctly evaluated by the CRA with probability 1, receiving a bad preliminary evaluation from either the first or the second contacted CRA reveals to the entrepreneur that the project is indeed bad. Buying after a bad preliminary from either CRA gives the entrepreneur a junk rating. There is no uncertainty in the final rating stage, thus the entrepreneur ends up saving the cost of contacting a second CRA (δ) and the fee (Φ). □

2.1.3 The CRA Decision on Effort

Let γ denote the effort level of the CRAs and $e = \frac{1}{2} + \frac{\gamma}{2}$ denote the accuracy of the signal without disclosure.

The uninformed CRA decides whether to exert effort when assessing the quality of the project submitted by the entrepreneur. Recall that μ_{IG} and μ_J are the updated beliefs on the reputation of the CRAs held by investors, respectively, when the project is given an IG rating or a J rating. When the preliminary contact is confidential, it is impossible for the contacted CRA to know whether the entrepreneur has already received an evaluation from another CRA. In the light of this, the CRA has to choose the effort taking into account that when she is contacted she could either be the first or the second expert to be approached.

The uninformed CRA is contacted with probability

$$\Pi = (1-\lambda)\left((1-\alpha)(1-e)(1-\lambda)\left(1-y_G\right) + \alpha\left(1-y_G\right) + 1\right)$$

first CRA when both issue a good preliminary.

The expected payoff for the CRA is

$$B(\gamma, y_G) = \pi_2 \left((1-e)\lambda\left(1-y_G\right) + e\lambda\right) + \pi_5 e\lambda \\ + (\pi_1 + \pi_3 + \pi_4)\lambda - c\gamma \tag{3}$$

where $\pi_1 = \frac{\alpha(1-\lambda)}{\Pi}$, $\pi_2 = \frac{(1-\alpha)(1-\lambda)}{\Pi}$, $\pi_3 = \frac{\alpha(1-\lambda)(1-\lambda)(1-y_G)}{\Pi}$, $\pi_4 = \frac{\alpha\lambda(1-\lambda)(1-y_G)}{\Pi}$ and $\pi_5 = \frac{(1-\alpha)(1-e)(1-\lambda)(1-\lambda)(1-y_G)}{\Pi}$. These are the probabilities the contacted CRA is uninformed, corresponding to the nodes where this type of CRA has to make a decision. Moreover, recall that $c\gamma$ is the cost that the uninformed CRA has to incur in order to become informed. The decision of the CRA can be summarised by the following

Lemma 2. *Let* $c_{ND} = \frac{(\alpha-1)\lambda((\lambda+1)y_G-\lambda+1)}{2((\alpha-1)\lambda+\alpha+1)y_G-2((\alpha-1)\lambda+\alpha+3)}$, *the CRA chooses to exert effort* ($\gamma = 1$) *when*

$$c < c_{ND} \tag{4}$$

When the cost of effort is lower than the tradeoff cost, the CRA exerts effort, whereas when the cost of getting informed is high, the CRA does not invest in effort. In a real world setting this could mean that when the CRA deals with relatively simple products (i.e. corporate bonds) she invests in effort whereas when products are complex (i.e. SFI) investment in information does not occur. This interpretation is in line with the findings in Rablen [2013] on optimality for the CRA to lie in the structured products market and truth tell in the corporate bond market.

2.1.4 Entrepreneur's Request of a Second Opinion

After the first informal review the entrepreneur can receive a good ($P = G$) or a bad ($P = B$) preliminary rating. After a good preliminary the entrepreneur decides whether to buy directly from the first CRA, ask for a second opinion or remain unrated. Similarly, after a bad preliminary the entrepreneur must decide whether to buy the final rating from the first CRA, from the second CRA or remainig unrated.

Lemma 3. *Following a*

(a) good preliminary the entrepreneurs does not remain unrated

(b) bad preliminary the entrepreneurs remains unrated

Proof. Since a good project is correctly evaluated by the CRA with probability one, stopping after a good preliminary is not optimal for the entrepreneur because, if it were the case, he would have never entered the game in the first place.
Since a good project is correctly evaluated by the CRA with probability one, receiving a bad preliminary evaluation reveals to the entrepreneur that the project is indeed bad. There is no uncertainty in the final rating stage, thus the entrepreneur by stopping saves δ. □

The above implies that the entrepreneur, when deciding, compares his payoff from buying from the first CRA with the payoff from asking a second opinion. Buying straight away gives him

$$\frac{\alpha V_G}{\alpha + (1-\alpha)(1-\lambda)(1-e)} - \Phi \tag{5}$$

while going ahead gives

$$\frac{\alpha V_G}{\alpha + (1-\alpha)(1-\lambda)(1-e)} - \delta - \Phi \frac{\alpha + (1-\alpha)(1-\lambda)^2(1-e)^2}{\alpha + (1-\alpha)(1-\lambda)(1-e)} \tag{6}$$

The decision of the entrepreneur is summarised by the following

Lemma 4. *Let* $m = \frac{\delta}{\Phi}$ *and* $q_\Phi = \frac{\alpha+(1-\alpha)(1-\lambda)^2(1-e)^2}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$*, given a good preliminary rating, the entrepreneur buys the final rating without contacting a second CRA if*

$$m > 1 - q_\Phi \tag{7}$$

Notice that q_Φ is the probability of paying the fee to the second CRA.[23] The higher q_Φ, the less likely it is that the entrepreneur decides to contact the second CRA. The idea is that the higher the consistency of the two CRAs towards a good rating, the higher the probability that the entrepreneur would buy from the second. Therefore knowing that he is more likely to save δ by paying immediately the fee to the first CRA. The entrepreneur chooses to ask for a second opinion when the above relation is reversed. This happens when the probability that the entrepreneur will receive another good preliminary is low and therefore he values the opinion of the second CRA as a mean of saving the fee.

[23] q_Φ can also be interpreted as the probability of receiving two good preliminary ratings, provided the decision to ask for a second opinion. Recall that according to Lemma 1 for the entrepreneur to buy after two preliminary ratings it has to be the case that they are both good.

2.1.5 The Equilibrium

This section investigates the equilibrium of the game. It can be shown that whenever the uninformed CRA exerts effort ($\gamma = 1$), the entrepreneur buys straight away because the investment in information ensures a correct signal. The signal is then followed by the CRA and upon payment of the fee it in turn leads to the correct final rating. Moreover if the entrepreneur prefers to ask a second opinion, the CRA doesn't have the incentive to exert effort. In other words

Lemma 5. *There cannot be an equilibrium where the CRA is dutiful and the entrepreneur shops for rating.*

Proof. If $\gamma = 1$ then $e = 1$, equation (7) becomes $m > 0$, which is always satisfied. Thus $y_G = 1$ is the entrepreneur's best response. □

If the CRA exerts effort, the preliminary is correct with certainty and therefore the entrepreneur knows what the final rating will be. Approaching a second CRA would make him lose the time cost (δ). A second opinion does not benefit the entrepreneur.
The Proposition below characterises the equilibria which can arise in the game without disclosure.

Proposition 1. *Let* $c^0_{ND} = \frac{\alpha\lambda^2-\alpha\lambda-\lambda^2+\lambda}{2\alpha\lambda+2\alpha-2\lambda+6}$, $\underline{m} = \frac{\alpha\lambda^2-\alpha-\lambda^2+1}{2\alpha\lambda+2\alpha-2\lambda+2}$ *and* $c^1_{ND} = \frac{1}{4}(2\lambda - 2\alpha\lambda)$ *, the equilibria in the model without disclosure are as follows*

(i) For $c > c^0_{ND}$ *and* $0 < m < \underline{m}$*, the entrepreneur shops for ratings, both CRAs, if uninformed, are lax and Lemma 1 applies*

(ii) For $0 < c < c^1_{ND}$*, the entrepreneur doesn't shop for ratings and the uninformed CRA is dutiful*

(iii) For $c > c^1_{ND}$ *and* $\underline{m} < m < 1$*, the entrepreneur doesn't shop for ratings but the uninformed CRA is lax*

Notice that c^0_{ND} (c^1_{ND}) is c_{ND} defined in Lemma 2 when $y_G = 0$ ($y_G = 1$) and that $c^1_{ND} > c^0_{ND}$. This relation among threshold simply states that the threshold below which the CRAs decide to exert effort is higher if the entrepreneur prefers not to ask for a second opinion. Notice also that Instead, $\underline{m}$ is decreasing both in α and λ.

Only equilibrium (ii) is informative according to Definition 3. The other two possible equilibria feature a lazy CRA which does not invest in information.

To better grasp the characteristics of these three types of equilibria and to picture them, let us separately look at four different combinations of c and m. Table 1 identifies four examples were c and m can be either high or low. Additional combinations of c and m can be found in Appendix A.

2.1.6 How do effort and contact costs alter the equilibrium outcome?

		Cost	
		Low	*High*
$\frac{\delta}{\Phi}$	*Low*	a	b
	High	c	d

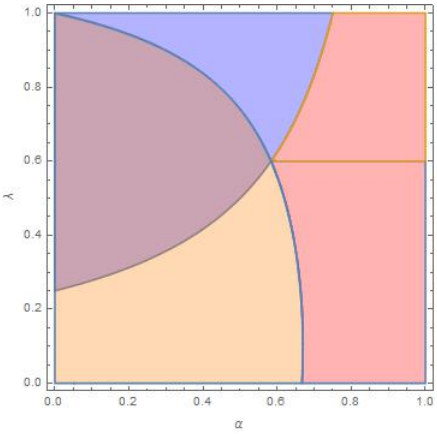
Table 1: c can take the values (0.125, 0.5) and $\frac{\delta}{\Phi}$ can take the values (0.1, 0.9). Combinations (c, m) are as follows: a $(0.125, 0.1)$; b $(0.5, 0.1)$; c $(0.125, 0.9)$; d $(0.5, 0.9)$.

As represented in Table 1 Configuration a (d) picture a situation in which both the effort cost and the relative cost of approaching a second CRA are low (high), Configuration b (c) instead represents a situation where the effort cost is high (low) and the cost of approaching a second CRA is low (high).

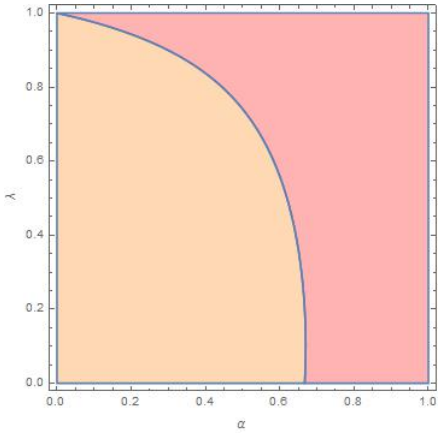
When c is high the equilibrium is unique and is either of type (i) and (iii). On the one hand, type (ii) is not an equilibrium because if the cost of effort is sufficiently high, the CRAs' incentive to invest in effort shrinks resulting in the CRAs not exerting effort. On the other hand, as the cost of approaching another CRA decreases, the decision of the entrepreneur to ask for a second opinion becomes more likely.

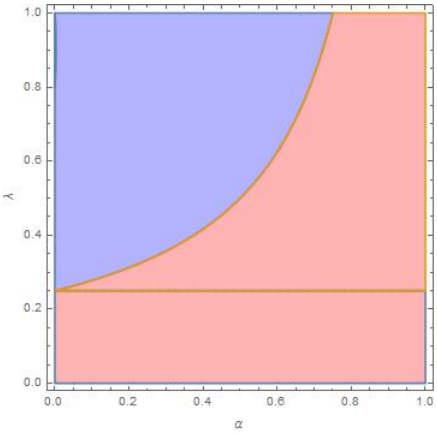
As m increases, equilibrium of type (i) disappears. Indeed a higher ratio between the cost of approaching a second CRA and the fee implies either an increase in δ without change in Φ or a reduction in the Φ but with a constant δ. Both cases make approaching a second CRA more costly for the entrepreneur. Hence he will buy from the first CRA. When c is also high, the CRA chooses not to exert effort and thus the only equilibrium in this case is equilibrium (iii).

(a) Configuration a

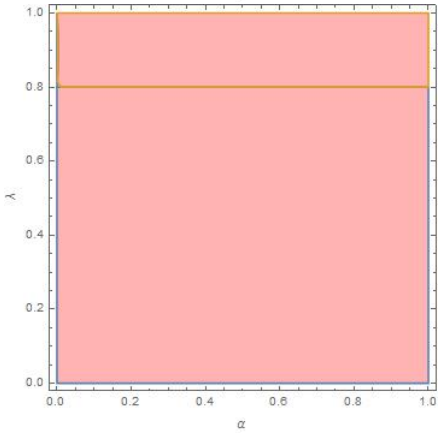


(b) Configuration b





(c) Configuration c



(d) Configuration d

Figure 1: Equilibrium without disclosure. From Proposition 1 the pink area pictures equilibrium (iii), the orange area equilibrium (i), and the blue area equilibrium (ii). The dark pink area shows multiplicity between equilibrium (i) and equilibrium (ii). Appendix A shows the different areas originating each of the configurations represented in this Figure. Each of the four graphs is the representation of the combinations of c and $\frac{\delta}{\Phi}$ shown in Table 1.

2.2 The Model with Contact Disclosure

I now assume that legislation is in place, so that the CRAs have to disclose any contact with the entrepreneur. In this case, the CRA knows if she is the first or the second to be contacted. The signal acquisition technology resembles the one previously described, however the effort level exerted by the CRA if uninformed is different, namely it is γ_1 for the first CRA and γ_2 for the second contacted CRA. The two CRAs no longer behave in the same way. Investors can now Bayesian update also in the case of no report. Investors know that an unrated project is of bad quality, but have to update their belief on the quality of the CRA.

Assumption 4. *Contacts for preliminary ratings are publicly known.*

2.2.1 Investors' Beliefs

In this setting, there are several possible observable outcomes. The investors can observe one or two contacts which did not result in a published rating. Similarly they can observe a published rating and either one or two contacts.[24] Investors update beliefs on the quality of the CRA according to which outcome they see. When they see $r = IG$ and just one contact the probability that the CRA is of the informed type is $\frac{\alpha\lambda y_G}{\alpha(1-\lambda)y_G+\alpha y_G} = \lambda$ and similarly if they see two contacts the probability is $\frac{\alpha\lambda(1-y_G)\lambda+\alpha(1-\lambda)(1-y_G)\lambda}{\alpha(1-y_G)} = \lambda$. The market is sure that the CRA is of the uninformed type whenever they see $r = J$, thus the probability that the CRA is informed is 0. This is because the informed CRA correctly evaluates the projects therefore a bad project never receives a published rating. With contact disclosure in place, even in the absence of a published rating the investors can infer something about the quality of the CRA. When they are informed of only one contact, the probability that the CRA is of the informed type is given by $\frac{\lambda}{(1-\lambda)e+\lambda}$ whereas in case of two contacts the probability becomes $\frac{\lambda}{(1-\lambda)\epsilon+\lambda}$. [25]

[24] The list of possible outcomes is $r = IG$ or $r = J$ with one contact, $r = IG$ or $r = J$ with two contacts, one contact or two contacts without any rating.

[25] The first formula is the simplified version of $Pr(I|NR, 2contacts) = \frac{Pr(NR,2contacts|I)Pr(I)}{Pr(NR,2contacts)} = \frac{(1-\alpha)(1-e)(1-\lambda)\lambda(1-y_G)}{(1-\alpha)(1-e)\lambda(1-\lambda)(1-y_G)+(1-\alpha)(1-e)(1-\lambda)^2\epsilon(1-y_G)}$ and the second is the simplified version of $Pr(I|NR, 1contact) = \frac{Pr(NR,1contact|I)Pr(I)}{Pr(NR,1contact)} = \frac{(1-\alpha)\lambda}{(1-\alpha)\lambda+(1-\alpha)e(1-\lambda)}$. Notice that e and ϵ are the accuracy of the signal of the first and second CRA respectively in the model without disclosure. Their formal definition is provided later.

2.2.2 Second Choice of the Entrepreneur

As pointed out earlier, allowing for contact disclosure does not affect the entrepreneur. His payoff does not change. With or without disclosure the information that the entrepreneur holds is the same. The burden of disclosure is on the CRA. Thus Lemma 1 still holds.

2.2.3 The Second CRA

Let γ_2 denote the effort level and $\epsilon = \frac{1}{2} + \frac{\gamma_2}{2}$ denote the accuracy of the signal of the second CRA with disclosure . To determine the level of effort the CRA compares its expected payoff. Compute the probability Π_2 for the CRA of being contacted as a second expert

$$\begin{aligned}\alpha(1-\lambda)^2(1-y_G) + \alpha\lambda(1-y_G)(1-\lambda) + (1-\alpha)(1-\lambda)^2(1-e)(1-y_G)\\ = (1-y_G)(1-\lambda)[\alpha + (1-\alpha)(1-\lambda)(1-e)]\end{aligned}$$

The probability for the CRA of earning the payoff associated with $r = IG$ when two CRAs are contacted is $\frac{\alpha(1-\lambda)(1-\lambda)(1-y_G)+\alpha(1-\lambda)\lambda(1-y_G)}{\Pi_2}$. Similarly the probability of earning the payoff associated with $r = NR$ when two CRAs are contacted is $\frac{(1-\alpha)(1-\lambda)(1-e)(1-y_G)(1-\lambda)\epsilon}{\Pi_2}$. The CRA gets 0 when a junk rating is published.[26] Thus the payoff takes the form

$$\begin{aligned}D(\epsilon, e) = &\frac{\lambda((1-\alpha)(1-e)(1-\lambda)\epsilon)}{(\lambda + (1-\lambda)\epsilon)(\alpha + (1-\alpha)(1-e)(1-\lambda))}\\ &+ \frac{\alpha\lambda}{\alpha + (1-\alpha)(1-e)(1-\lambda)} - c\gamma_2\end{aligned} \tag{8}$$

The decision of the second CRA is summarised by the following

Lemma 6. *Let* $c_{D2} = \frac{(\alpha-1)(\gamma_1-1)(\lambda-1)\lambda^2}{(\alpha-1)(\gamma_1-1)\lambda^2-\alpha(\gamma_1+1)-2\alpha\lambda+\gamma_1-1}$*, the CRA chooses to exert effort (*$\gamma_2 = 1$*) when*

$$c < c_{D2} \tag{9}$$

Proof is given in Appendix B. If the cost of becoming informed is high enough ($c > c_{D2}$), it is expensive for the CRA to exert effort and therefore she prefers not to do so. If the cost is sufficiently low instead ($c < c_{D2}$), the CRA could gain more investing in effort and becoming perfectly informed.

[26] Recall that the payoff associated with $r = IG$ is simply λ while the one associated with $r = NR$ is $\frac{\lambda}{(1-\lambda)\epsilon+\lambda}$.

2.2.4 First Choice of the Entrepreneur

The first choice of the entrepreneur involves deciding if it is optimal to contact a second CRA or not. To do so the entrepreneur compares his payoff from buying from the first CRA with the payoff from asking a second opinion. Buying straight away gives him (5) whereas going ahead gives

$$\frac{\alpha V_G}{\alpha + (1-\alpha)(1-\lambda)(1-e)} - \delta - \Phi \frac{\alpha + (1-\alpha)(1-\lambda)^2(1-e)(1-\epsilon)}{\alpha + (1-\alpha)(1-\lambda)(1-e)} \tag{10}$$

Summarising the decision of the entrepreneur

Lemma 7. *Let* $m = \frac{\delta}{\Phi}$ *and* $z_\Phi = \frac{\alpha+(1-\alpha)(1-\lambda)^2(1-e)(1-\epsilon)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$*, given a good preliminary rating, the entrepreneur buys the final rating without contacting a second CRA if*

$$m > 1 - z_\Phi \tag{11}$$

The equivalent of Lemma 3 still holds. In Lemma 7, z_Φ can be interpreted as q_Φ. In particular

Corollary 1. *If (i)* $e = \epsilon$ *then* $q_\Phi = z_\Phi$ *(ii)* $e < \epsilon$ *(*$e > \epsilon$*) then* $q_\Phi > z_\Phi$ *(*$q_\Phi < z_\Phi$*)*

The above implies that Lemma 4 is a special case of Lemma 7. If the first CRA exerts effort and the second does not, under disclosure there is a higher probability of receiving two good preliminary ratings having decided to ask for a second opinion. It is therefore less likely that the entrepreneur decides to contact the second CRA with respect to the case in which the CRAs operate in an opaque market.

2.2.5 The First CRA

Let γ_1 denote the effort level and $e = \frac{1}{2} + \frac{\gamma_1}{2}$ denote the accuracy of the signal of the first CRA with disclosure . To determine the level of effort the first CRA compares its expected payoff. Compute the probability for the CRA of being contacted in the first round

$$\Pi_1 = \alpha(1-\lambda) + (1-\alpha)(1-\lambda) = 1 - \lambda$$

The CRA earns the payoff derived from a $r = IG$ when only one contact occurs with probability $\frac{\alpha(1-\lambda)y_G}{1-\lambda}$. The probability of earning the payoff associated with $r = IG$ when

two CRAs are contacted is $\frac{\alpha(1-\lambda)(1-y_G)}{1-\lambda}$. Similarly the probability of earning the payoff associated with $r = NR$ when two CRAs are contacted is $\frac{(1-\alpha)(1-\lambda)(1-e)(1-y_G)[(1-\lambda)\epsilon+\lambda]}{1-\lambda}$ whereas when only one is contacted the probability is $\frac{(1-\alpha)(1-\lambda)e}{1-\lambda}$. Notice that whenever the CRA issues a junk rating its payoff is 0.

The expected payoff therefore is

$$d(\gamma_1, y_G) = \alpha\lambda + \frac{(1-\alpha)e\lambda}{e(1-\lambda)+\lambda} + (1-\alpha)(1-e)\lambda\,(1-y_G) - c\gamma_1 \tag{12}$$

In $d(\gamma_1, y_G)$ there is no opaqueness about being the first CRA to be contacted thus the payoff only depends on the decision of the CRA and on that of the entrepreneur. Instead, $B(\gamma, y_G)$ not only depends on the decision of the entrepreneur but also on the decision of both CRAs. The decision of the first CRA can be summarised in the following way

Lemma 8. *Let* $c_{D1} = -\frac{(\alpha-1)\lambda((\lambda+1)y_G+\lambda-1)}{2(\lambda+1)}$*, the CRA chooses to exert effort* ($\gamma_1 = 1$) *when*

$$c < c_{D1} \tag{13}$$

Proof is given in Appendix B. As it is for the first CRA, if the cost of becoming informed is high ($c > c_{D1}$), it is too costly for the CRA to exert effort and therefore she prefers not to do so. If the cost is sufficiently low instead ($c < c_{D1}$), the CRA gains more investing in effort and becoming perfectly informed.

2.2.6 The Equilibrium

This section investigates how the game's equilibrium differs from the model without disclosure. The relevant equilibrium concept is Perfect Bayesian Equilibrium.

Lemma 9. *There cannot be an equilibrium where*

(a) the first CRA is dutiful and the entrepreneur shops for ratings.

(b) both the first CRA and the second CRA are dutiful.

(c) the entrepreneur prefers to buy from the first CRA and the second CRA is dutiful.

Proof. (a) $\gamma_1 = 1$ implies $e = 1$ and in turn z_Φ simplifies to 1. Thus Lemma 7 is satisfied because $m > 0$. Thus $y_G = 1$ is the entrepreneur's best response regardless of the choice of the second CRA.

(b) If $e = 1$, equation (8) becomes $\lambda - c\left(\frac{\epsilon}{2} + \frac{1}{2}\right)$. By substituting the maximum and the minimum level of effort, it can be shown that the second CRA always prefers $\gamma_2 = 0$ to $\gamma_2 = 1$. In formula $c > \frac{c}{2}$ which is true $\forall\{\alpha, \lambda\} \in (0, 1)$ and $\forall c > 0$

(c) If $(y_G = 1)$, the second CRA is aware that she won't be contacted. Thus she has no incentive to exert effort.

□

The intuition goes as follows: (a) if the uninformed CRA is dutiful, the preliminary is for sure correct and so will be the final rating, thus asking a second opinion only results in the pointless payment of δ with the possibility of ending up with no funding if the report is negative. In (b) there is no incentive for the second CRA to exert effort if the first CRA has already done so because the entrepreneur would buy from the first and the second wouldn't even be contacted. Similarly if the second CRA prefers to exert effort it has to be the case that the first didn't do so because otherwise the second would not be contacted by the entrepreneur. Thus only one CRA has the incentive to invest in information. In (c), a purchase from the first CRA gives no incentive to the second one because the entrepreneur won't buy from her.
As in the benchmark, if the entrepreneur prefers to ask a second opinion, the first CRA will never exert effort. In other words Lemma 5 still holds with the only difference that γ is now γ_1. Moreover, if the first CRA exerts effort, the best response for the second CRA is not to exert effort.

The Proposition below characterises the equilibria which can arise in the game with contact disclosure.

Proposition 2. *Let* $c^0_{D2} = \frac{\alpha\lambda^3 - \alpha\lambda^2 - \lambda^3 + \lambda^2}{\alpha\lambda^2 + 2\alpha\lambda + \alpha - \lambda^2 + 1}$, $c^1_{D1} = \frac{\lambda^2 - \alpha\lambda^2}{\lambda + 1}$ *and* $\bar{m} = \frac{\alpha\lambda - \alpha - \lambda + 1}{\alpha\lambda + \alpha - \lambda + 1}$ *the equilibria in the game with contact disclosure are as follows*

(i) For $c > c^0_{D2}$ *and* $0 < m < \underline{m}$ *, the entrepreneur shops for ratings and both CRAs are lax*

		Cost	
		Low	*High*
$\frac{\delta}{\Phi}$	*Low*	A	B
	High	C	D

Table 2: c can take the values (0.125, 0.5) and $\frac{\delta}{\Phi}$ can take the values (0.1, 0.9). Combinations (c, m) are as follows: A $(0.125, 0.1)$; B $(0.5, 0.1)$; C $(0.125, 0.9)$; D $(0.5, 0.9)$.

(ii) For $0 < c < c^1_{D1}$, the entrepreneur doesn't shop for ratings the 1st CRA is dutiful and the 2nd is lax

(iii) For $c > c^1_{D1}$ and $\underline{m} < m < 1$, the entrepreneur doesn't shop for ratings and both CRAs are lax

(iv) For $0 < c < c^0_{D2}$ and $0 < m < \bar{m}$, the entrepreneur shops for ratings, the 1st CRA is lax and the 2nd is dutiful

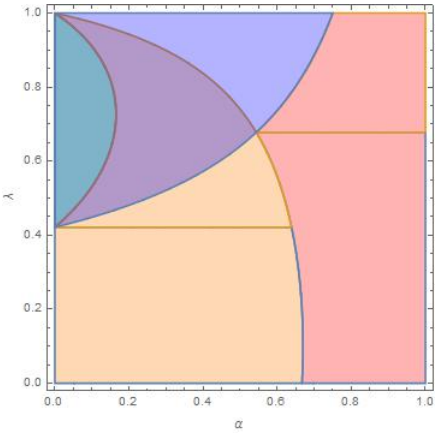
Moreover in (i), (ii), (iii) and (iv) Lemma 1 applies.

Notice that c^0_{D2} is c_{D2} defined in Lemma 6 when $\gamma_1 = 0$ and c^1_{D1} is c_{D1} defined in Lemma 8 when $y_G = 1$ and that $c^1_{D1} > c^0_{D2}$. This relation saying that the second CRA, if contacted, has a lower threshold below which she invest in information compared to the threshold below which the first CRA exerts effort when no second opinion is asked. The reason stands in the possibility for the second CRA to free ride on the first CRA, dampening the incentives for the second CRA to exert effort. Notice also that $\underline{\mathrm{m}} < \bar{m}$ and $\underline{\mathrm{m}}$ is non monotonic in λ and decreasing in α.

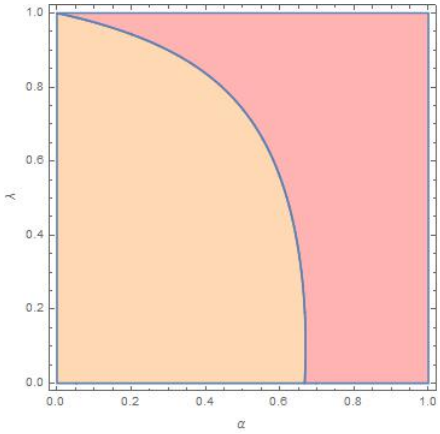
The relation among the thresholds from Proposition 1 and Proposition 2 is explained in Lemma 11. Equilibrium (ii) and (iv) are informative equilibria whereas equilibrium (i) and (iii) are uninformative. The informative ones feature respectively an investment in information on the side of the first CRA or effort exerted by the second contacted CRA.

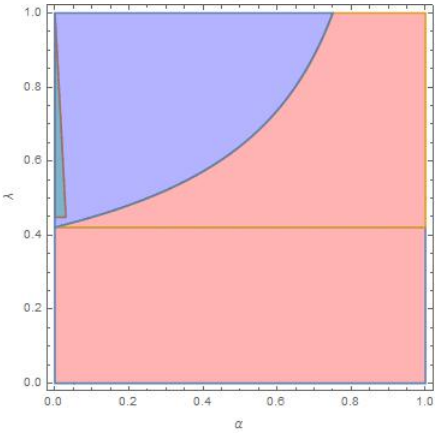
As before to better grasp the characteristics of these four types of equilibria and to picture them, let us separately look at four different combinations of c and m. Table 2 identifies four examples were c and m can be either high or low.

(a) Configuration A

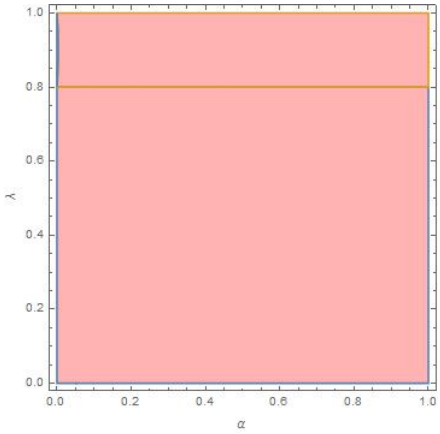


(b) Configuration B





(c) Configuration C



(d) Configuration D

Figure 2: Equilibrium with contact disclosure. From 2 the pink area pictures equilibrium (iii), the orange area equilibrium (i) and the blue area equilibrium (ii). The dark pink area shows multiplicity between equilibrium (i) and equilibrium (ii) and the dark turquoise area shows multiplicity between equilibrium (ii) and equilibrium (iv). Appendix A shows the different areas originating each of the configurations represented in this Figure. Each of the four graphs is the representation of the combinations of c and m shown in Table 2.

2.2.7 How do effort cost and contact cost alter the equilibrium outcome

As represented in Table 2 Configuration A (D) represent a situation in which both the effort cost and the relative cost of approaching a second CRA are low (high), Configuration B (C) instead represents a situation where the effort cost is high (low) and the cost of approaching a second CRA is low (high).

When c is high the equilibrium is unique and can be of type (i) or (iii). Type (ii) and (iv) are not equilibria because if the cost of effort is sufficiently high, none of the CRAs would have an incentive to invest in order to exert effort. On the other hand, as the cost of approaching another CRA decreases, the entrepreneur is more likely to ask for a second opinion. The parameter space covered by Equilibrium (iii), everything else equal, shrinks as the cost of effort decreases. The reason is the higher willingness of the first contacted CRA to exert effort de facto preventing the entrepreneur from contacting the second CRA. A similar reasoning applies to equilibrium (iv), everything else equal, expands as the cost of effort decreases. The reason stands in the higher willingness of the second contacted CRA to exert effort in the light of the choice of the entrepreneur to ask for a second opinion.

As m increases, equilibrium (iv) shrinks and equilibrium (i) disappears. When it becomes expensive for the entrepreneur to contact another CRA, the entrepreneur will pay such a cost only if the environment is bad (α is extremely low). In all other cases the entrepreneur prefers to buy the final rating from the first CRA. Increasing m cancels equilibrium (i) de facto eliminating one of the two situations in which none of the contacted CRAs would exert effort.

3 Comparing the two regimes

Comparing Figure 1 with Figure 2 reveals a clear pattern. Combination b and d in Figure 1 are unaffected by the mandatory disclosure requirement. Moreover combination B and D in Figure 2 resemble them perfectly. Thus for sufficiently high levels of c, disclosing the contact between the CRA and the entrepreneur has no effect on the equilibrium. The reasoning goes as follows: when the cost of becoming informed is high (which may happen when the projects are complex), CRAs don't invest in information because it is

too expensive and mandating disclosure has no effect on c. Similarly the entrepreneur is unaffected by the disclosure requirement. Hence the behaviour of the players is unaffected and so is the resulting equilibrium. This implies that when the CRA has a limited know how, the regulator has to focus on else than disclosure. From now on the focus will only be on the case where becoming informed comes at a low cost.

Disclosure results in a higher probability that both CRAs exert no effort whenever the cost of becoming informed is sufficiently low. Thus the area defining the informative equilibrium characterised by the first CRA exerting effort and the entrepreneur purchasing the final rating from her, shrinks when the disclosure requirement is in place.[27]

In this setting, improved competition can result from a lower cost of contacting a second CRA (δ). Given a fixed fee, a decrease in δ and therefore a decrease in m causes the increase in the space of parameters' combinations regarding the other informative equilibrium featuring effort for the second CRA. Such an equilibrium is a feature of the model mandating contact disclosure as it does not exist in the absence of disclosure. It arises because, once the contact is public and the second CRA is contacted, the CRA has an incentive to become informed and in turn gain reputation.

Despite the fact that under disclosure the space of parameters' combinations for an informative equilibrium is characterised by two different types of equilibria, overall, improved competition does not result in more information, because equilibrium (iv) replaces part of equilibrium (i) but equilibrium (ii) shrinks.

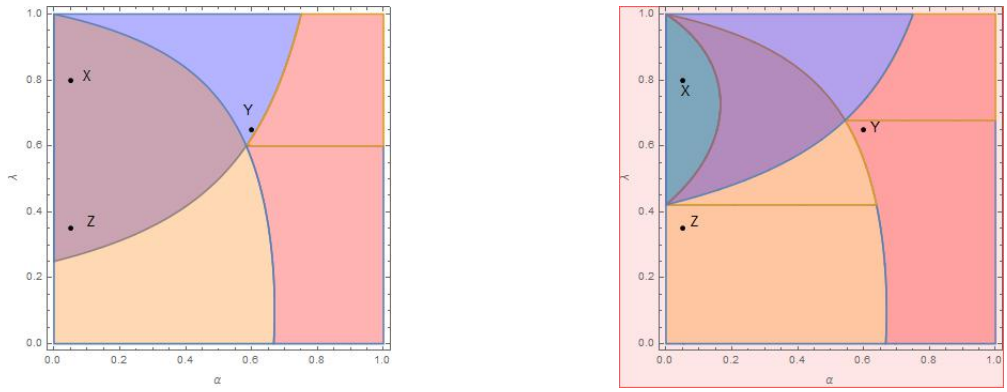
The CRA's payoff from exerting effort is unaffected by the disclosure regime in place.[28] What changes is the CRA's payoff from not exerting effort.

Lemma 10. *Regardless of the decision of the entrepreneur, not exerting effort is more profitable under disclosure than with no disclosure in place.*

Proof is given in the appendix. The idea is that exerting effort provides a payoff of λ at a cost c irrespective of the disclosure regime because of the effort structure (i.e. correct signal). Not exerting effort instead is more costly in terms of reputation without disclosure because with disclosure each of the two CRAs free rides on the other. The second CRA can free ride the first CRA, whereas the first CRA can get something for nothing if the second

[27] Figure 7 (b), Figure 9 (a) and Figure 10 (b), Figure 12 (a) in Appendix A clearly picture the difference in this informative area.

[28] In both cases it is equal to $-c + \lambda$.



(a) Model without disclosure **(b)** Contact disclosure model

Figure 3: Comparison of equilibrium representation where $c = 0.125$, and $m = 0.1$.

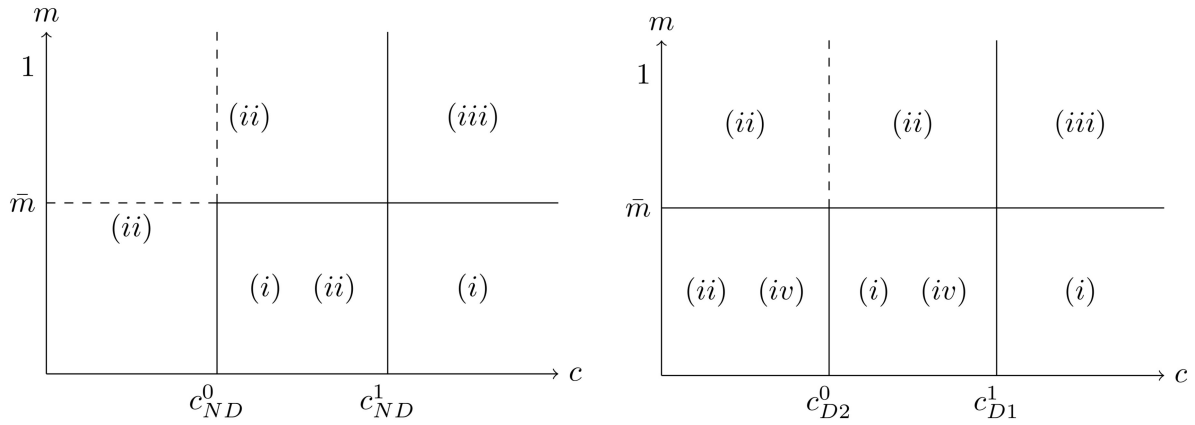
CRA happens to be correct in its evaluation. The main implication of Lemma 10 is that whenever no effort is preferred to exerting effort this result is reinforced under disclosure whereas, when effort is preferred to no effort the increase in the payoff from not exerting effort can either result in the same decision under disclosure or it could cause a shift in the preference of the CRA towards no effort. To show this, consider the parameter combinations given by points X, Y and Z in Figure 3. Without disclosure Z belongs to a multiplicity area where either an informative equilibrium (equilibrium (ii)) applies or where an uninformative one applies (equilibrium (i)). Mandating contact disclosure leads to a situation where only equilibrium (i) occurs. Similarly in Y is characterised by an informative equilibrium (equilibrium (i)) when there is no evidence of contact disclosure. As this becomes mandatory the relevant equilibrium is of the uninformative type (equilibrium (iii)). Slightly different is the case of X where the implementation of the disclosure regime results in the raise of two informative equilibria instead of a single one and in the disappearance of the uninformative one.

It is worth to compare the thresholds in Proposition 1 and Proposition 2 to provide a general Lemma.

Lemma 11. *The relation among the thresholds c_{ND}, c^0_{ND}, c^1_{D1} and c^0_{D2} is such that*

1. $c_{ND} > c_{D1}$
2. $c^0_{ND} > c^0_{D2}$ *if* $0 < \lambda < \widetilde{\lambda}$ *otherwise* $c^0_{ND} < c^0_{D2}$

where $\widetilde{\lambda} = -\sqrt{\frac{\alpha^2+8}{(\alpha-1)^2}} - \frac{3}{\alpha-1}$ *and* $\frac{\partial\tilde{\lambda}}{\partial\alpha} > 0$



(a) Proposition 1 **(b)** Proposition 2

Figure 4: Summary of equilibria .

Lemma 11 states that when disclosure is mandatory (i) no matter the decision of the entrepreneur to contact another CRA, the threshold below which the first CRA exerts effort is lower; (ii) if the entrepreneur shops for ratings and the first CRA does not exert effort, the threshold below which the second CRA would exert effort is lower (higher) when λ is low (high). Proof is given in Appendix B.

Moreover the following is true: (i) the equilibrium characterised by no shopping for rating and both CRAs being possibly dutiful become an equilibrium where only the first CRA is dutiful; (ii) the equilibrium characterised by no shopping for rating and both CRAs being possibly lax still exists but is now larger; (iii) an equilibrium characterised by shopping for rating where only the second CRA is dutiful arises.

Hereafter I will focus only on the relation on the one hand between c^1_{ND} and c^1_{D1} while on the other between c^0_{ND} and c^0_{D2}. It is easy to see from Figure 4 that if $c^1_{ND} > c^1_{D1}$, both uninformative equilibria under disclosure occur for lower cost. More complex is the case if c^0_{ND} and c^0_{D2}. In particular if $c^0_{ND} > c^0_{D2}$, the larger is the threshold without disclosure with respect to the one with disclosure, the less likely it is that the new informative equilibrium arises. Conversely in a situation where $c^0_{ND} < c^0_{D2}$, the same equilibrium occurs also for higher values of c. This implies that undoubtedly disclosure results in an increase of the uninformative equilibria and in the shrink of the informative one. It is also without any doubt that this transparency requirement results theoretically in the creation of another informative equilibrium. If λ is sufficiently low, this novelty is combined with

the increase in one of the uninformative equilibria, whereas if λ is high this equilibrium shrinks.

Overall, the first CRA is less likely to exert effort than before whereas the second CRA can either be more likely or less likely to exert effort according to the reputation at the outset. The reasoning goes as follows: if α is low, the entrepreneur prefers to save the Φ and ask for a second opinion because it is likely that the project is bad. In this situation the second CRA prefers to exert effort, hence evaluating correctly the project to the benefit of its reputation.

Disclosure dampens the incentives of the first CRA to exert effort while it provides the correct ones to the second CRA in certain situations. The rationale is as follows: the opacity of the market results in the CRA not knowing the sequence of events and therefore more willing to take the chance to exert effort to compensate for this lack of information. When there is transparency instead, the second CRA free rides on the first ($c^0_{D2} < c^1_{D1}$), the first CRA exerts less effort because she can gain also thanks to the second CRA ($c_{ND} > c_{D1}$). Moreover the second CRA has the correct incentives when the state of the world is such that not exerting effort is likely to result in a mistake whereas she has less incentives when the situation is the opposite.

4 Absence of competition

4.1 The Model without Disclosure

I want to ask what happens when δ is sufficiently high. [29] If contacting a second CRA is extremely expensive then 4.3 implies that the entrepreneur always buys from the first CRA and therefore never contacts the second one. The CRA in turn has an expected payoff of $-c+\lambda$ when effort is exerted ($\gamma = 1$) and of $\frac{1}{2}(1+\alpha)\lambda$ when no effort is exerted ($\gamma = 0$). The CRA will prefer not to exert effort whenever

$$-c+\lambda < \frac{1}{2}(1+\alpha)\lambda \tag{14}$$

[29] δ high corresponds to a situation where the relationship between the parties is well established and the information held is extensive. Under these circumstances, approaching a different CRA requires a lot of time and huge effort such that the switch cost is nearly unbearable.

If $\alpha > \frac{1}{2}$, 14 is true $\forall c, \lambda$. When instead $\alpha < \frac{1}{2}$, the choice of the CRA is

$$\begin{cases} \gamma = 0, & c > \lambda(\frac{1}{2} - \alpha) \\ \gamma = 1, & \text{otherwise} \end{cases} \tag{15}$$

In other words, when there are many good projects in the economy the CRA has no incentive to exert effort if the entrepreneur is not going to approach another CRA. On the other hand when good projects are rare, if the cost of becoming informed is high, the CRA prefers not to exert effort, but if the cost is low she makes the investment.

The rationale is that with a high cost of contacting another CRA the entrepreneur prefers to buy directly from the first CRA. Thus the incentive for the CRA to invest in effort is strong only when a priori the probability of the project being good and the cost are both low.

4.2 The model with Contact Disclosure

As above, if contacting a second CRA is extremely expensive then equation 4.3 implies that the entrepreneur always buys from the first CRA and thus he never contacts the second one. The first CRA has an expected payoff of $-c + \lambda$ when effort is exerted ($\gamma_1 = 1$) and of $\frac{\lambda(1+\alpha\lambda)}{1+\lambda}$ when no effort is exerted ($\gamma = 0$). The first CRA will prefer not to exert effort whenever

$$-c + \lambda < \frac{\lambda(1 + \alpha\lambda)}{1 + \lambda} \tag{16}$$

When $c > \lambda^2 \left(\frac{1-\alpha}{1+\lambda}\right)$, the first CRA doesn't exert effort, whereas if $c < \lambda^2 \left(\frac{1-\alpha}{1+\lambda}\right)$ the CRA exerts effort.

4.3 Discussion

Rearranging (14) and (16) it is possible to isolate the thresholds above which the CRA chooses not to exert effort under the two different disclosure regimes. Whenever the cost of getting informed exceeds $\lambda(\frac{1}{2} - \alpha)$ under no disclosure and $\lambda^2 \left(\frac{1-\alpha}{1+\lambda}\right)$ under disclosure, the CRA has a 50% chance of providing a correct preliminary without bearing the cost of effort.

Proposition 3. *With contact disclosure and absence of competition (δ high), relative to the case with no disclosure*

1. *if $\alpha > \frac{1-\lambda}{2}$, the CRA is less likely to exert no effort*
2. *if $\alpha < \frac{1-\lambda}{2}$, the CRA is more likely to exert no effort*

Proof is given in the appendix. Figure 5 and Figure 6 summarises this finding. With

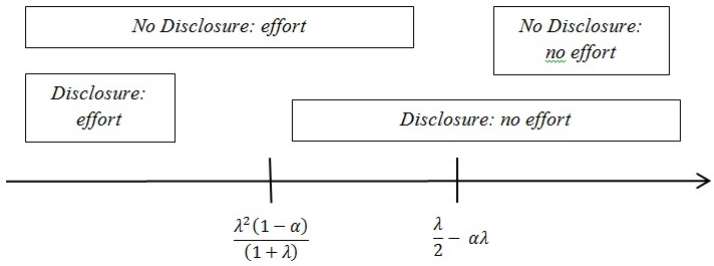


Figure 5: Thresholds cost when $\alpha < \frac{1-\lambda}{2}$

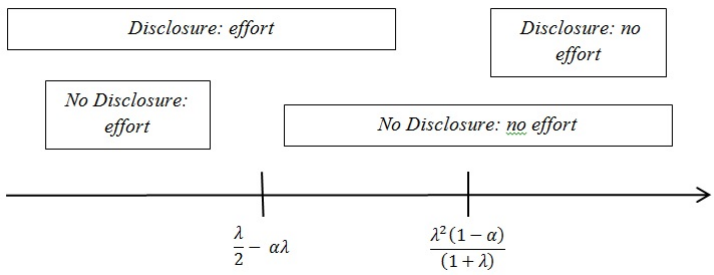


Figure 6: Thresholds cost when $\alpha > \frac{1-\lambda}{2}$

no mandatory disclosure below $\lambda(\frac{1}{2} - \alpha)$ the CRA exerted effort whereas with disclosure in place effort is exerted up to $\lambda^2\left(\frac{1-\alpha}{1+\lambda}\right)$. When $\alpha < \frac{1-\lambda}{2}$ the first threshold is higher than the second, while when $\alpha > \frac{1-\lambda}{2}$ the opposite is true. When α is low, disclosure results in a weaker incentive to exert effort whereas when α is high, the incentive to invest in information is stronger. The intuition goes as follows. Investing in information ensures that the preliminary is correct. When the projects are more likely to be good, this means that the CRA is likely to issue a good preliminary making the entrepreneur willing to buy the final rating. When the projects are more likely to be bad, the fact that the

preliminary rating is correct reduces the chances for the CRA to get the fee because with a bad preliminary the entrepreneur remains unrated.

Concluding Remarks

This paper models an environment where CRAs compete in issuing preliminary ratings. I focus on the effect of contact disclosure on the choices of the competing CRAs. In this setting, the entrepreneur can contact at most two experts. The first CRA issues a preliminary rating, after receiving this indicative rating, the entrepreneur has the opportunity to either purchase a full report at a cost or to ask a second opinion. Following the second preliminary rating, the entrepreneur decides whether to remain unrated or to pay for the final rating.

Comparing the regime with no mandatory disclosure to the regime with disclosure, if it is costly for the CRAs to become informed, the equilibrium is unique and mandatory disclosure has no effect. When instead the effort cost is relatively low, disclosure implies that the space of parameters' combinations for which an informative equilibrium exists becomes smaller. Nonetheless an additional informative equilibrium arises where the second CRA exerts effort. Disclosure never results in more information in the system but gives either of the CRAs the incentive to exert effort.

Increased competition results in the increase of the parameters' space where the entrepreneur shops for rating and only the second CRA exerts maximum effort. Under disclosure this tendency is reinforced.

There are a couple of main implications. First, if financial products are complex, mandatory disclosure has no effect. Second, in bad times mandatory disclosure gives the second contacted CRA the incentives to invest in information. Thirdly, contact disclosure affects negatively the first CRA to be contacted.

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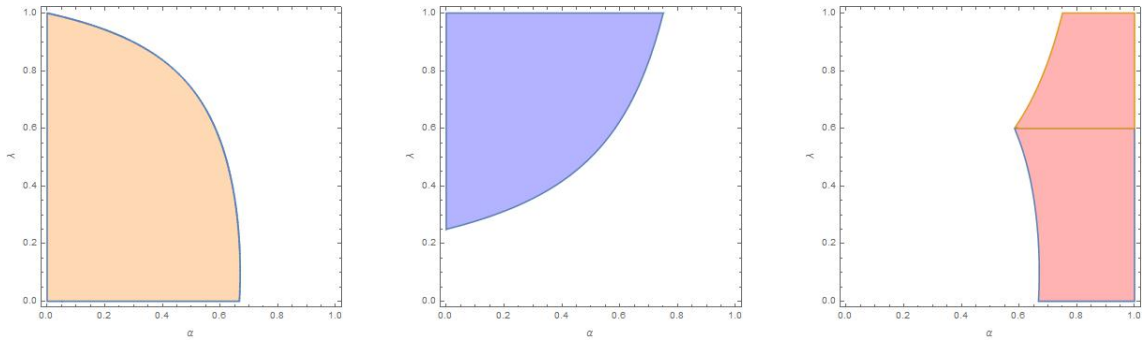
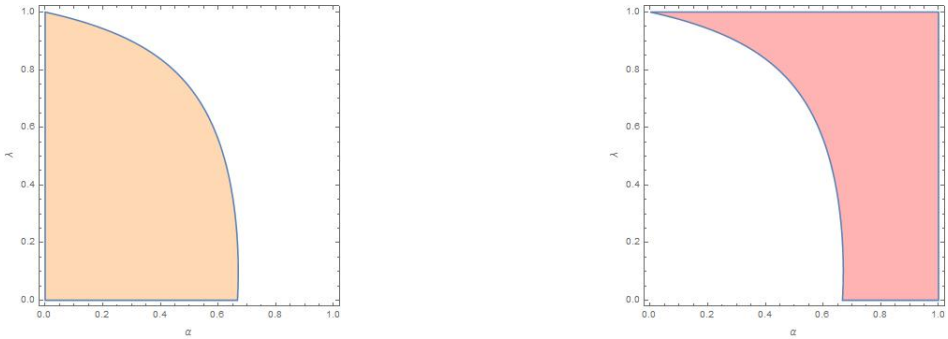
Appendix A

No Disclosure and Contact Disclosure equilibrium areas



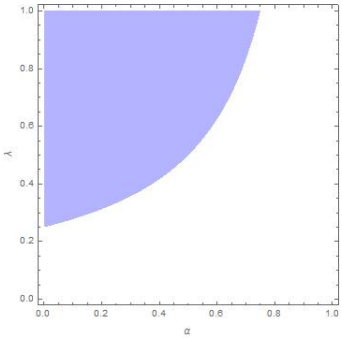
(a) Equilibrium (i) **(b)** Equilibrium (ii) **(c)** Equilibrium (iii)

Figure 7: Figure 1 (a) areas covered by each type of equilibria

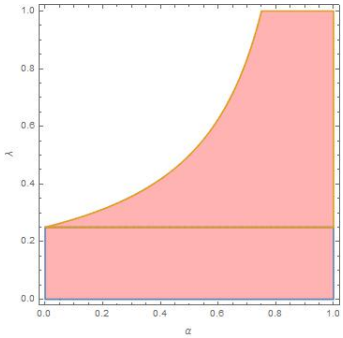


(a) Equilibrium (i) **(b)** Equilibrium (iii)

Figure 8: Figure 1 (b) areas covered by each type of equilibria

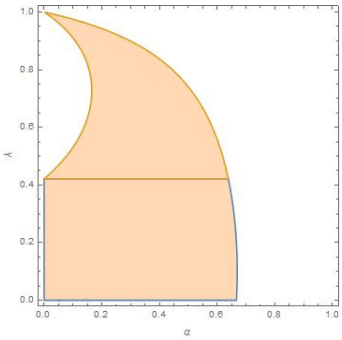


(a) Equilibrium (ii)

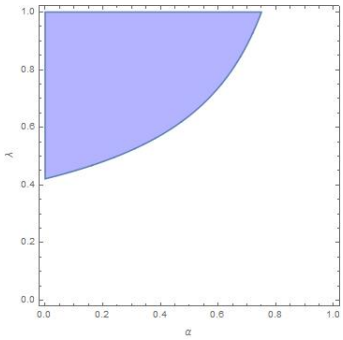


(b) Equilibrium (iii)

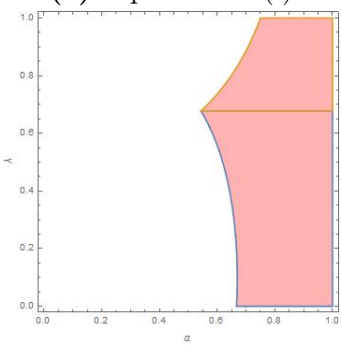
Figure 9: Figure 1 (c) areas covered by each type of equilibria



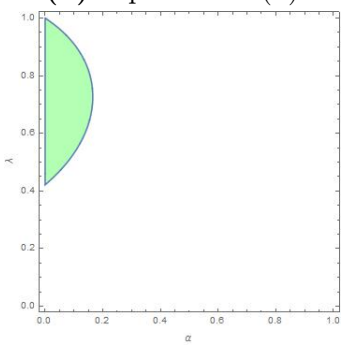
(a) Equilibrium (i)



(b) Equilibrium (ii)

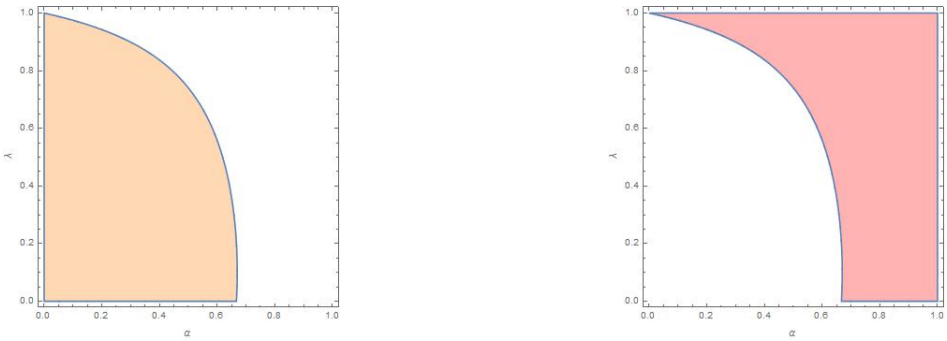


(c) Equilibrium (iii)



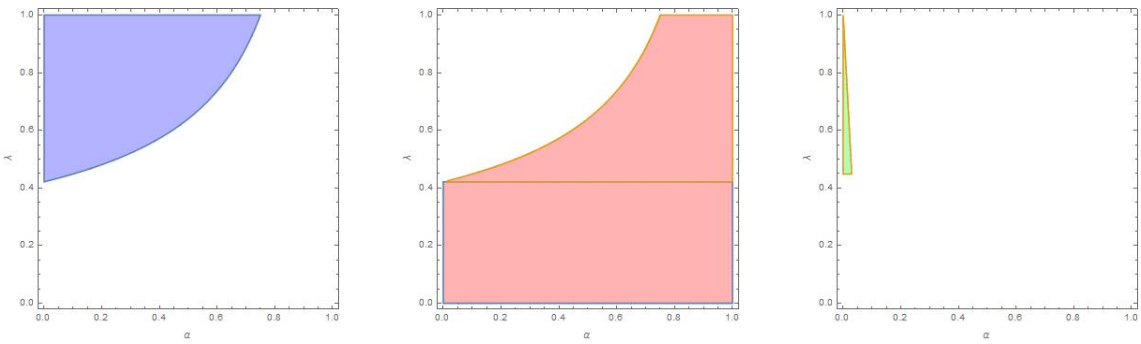
(d) Equilibrium (iv)

Figure 10: Figure 2 (A) areas covered by each type of equilibria



(a) Equilibrium (i) **(b)** Equilibrium (iii)

Figure 11: Figure 2 (B) areas covered by each type of equilibria



(a) Equilibrium (ii) **(b)** Equilibrium (iii) **(c)** Equilibrium (iv)

Figure 12: Figure 2 (C) areas covered by each type of equilibria

Appendix B

Proof of Lemma 2

Let $B(1, y_G)$ be 3 when the CRA exerts effort and similarly let $B(0, y_G)$ be 3 when the CRA doesn't exert effort. In order for the CRA to prefer to exert effort $B(1, y_G)$ has to be greater than $B(0, y_G)$, in formula

$$\lambda - c > \frac{\lambda\left(-\alpha(\lambda+3) + ((\alpha-1)\lambda + \alpha + 3)y_G + \lambda - 5\right)}{2((\alpha-1)\lambda + \alpha + 1)y_G - 2((\alpha-1)\lambda + \alpha + 3)}$$

which rearranging leads to $c < c_{ND}$.

Proof of Lemma 4

The probability associated with receiving a good preliminary from the first CRA is

$$\alpha\lambda + \alpha(1-\lambda) + (1-\alpha)(1-\lambda)(1-e) = \alpha + (1-\alpha)(1-\lambda)(1-e)$$

When purchasing the final report the entrepreneur pays the fee Φ with probability 1, receives V_G with probability $\frac{\alpha\lambda+\alpha(1-\lambda)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$, and 0 with probability $\frac{(1-\alpha)(1-\lambda)(1-e)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$. Hence the payoff in this case is 5.
When asking for a second opinion the entrepreneur pays the cost δ with probability 1, receives V_G and 0 with the same probability of the purchasing case but pays the fee with probability $\frac{\alpha+(1-\alpha)(1-\lambda)^2(1-e)^2}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$. Hence the payoff in this case is 6. The entrepreneur chooses to buy if $5 > 6$, namely

$$m > \frac{(1-\alpha)(1-\lambda)(1-e)[1-(1-\lambda)(1-e)]}{\alpha + (1-\alpha)(1-\lambda)(1-e)}$$

where $m = \frac{\delta}{\Phi}$.

Proof of Proposition 1

To begin, recall that without contact disclosure the effort is the same for both CRAs, thus both CRAs behave in the same way, as if they were one player. If $y_G = 1$, for the CRA

to prefer to exert effort instead of not exerting it has to be that Lemma 2 holds. When the CRA exerts effort, the ENT faced with $P = G$ never remains unrated (Lemma 3 a) and chooses to ask for the official rating instead of approaching a second CRA if Lemma 4 holds. The CRA prefers not to exert effort when Lemma 2 is not satisfied. When the CRA doesn't exert effort, the ENT faced with $P = G$ will choose to ask for the official rating instead of approaching a second CRA if Lemma 4 holds. By Lemma 3 b, the ENT faced with $P = B$ always chooses to remain unrated. Thus, there exist an equilibrium of the type $\gamma = 1$, $y_G = 1$ and an equilibrium of the type $\gamma = 0$, $y_G = 0$. If $y_G = 0$ for the CRA to prefer not to exert effort it has to be the case that Lemma 2 isn't satisfied. When the CRA doesn't exert effort, the ENT faced with $P = G$ will choose to ask for the official rating instead of approaching a second CRA if Lemma 4 holds. Lemma 5 rules out equilibria in which the CRA exerts effort and the ENT faced with $P = G$ prefers to ask for a second opinion. Lemma 3 once again rules out equilibria in which the ENT faced with $P = B$ prefers something different from remaining unrated. Hence there exists an equilibrium of the type $\gamma = 0$, $y_G = 0$.

Lemma 6

Let $D(1, \gamma_1)$ be 8 when the CRA exerts effort and similarly let $D(0, \gamma_1)$ be 8 when the CRA doesn't exert effort. In order for the CRA to prefer to exert effort $D(1, \gamma_1)$ has to be greater than $D(0, \gamma_1)$, in formula $\lambda - c > \frac{\lambda(\alpha(\gamma-3)\lambda-\alpha(\gamma+1)+\gamma(-\lambda)+\gamma+\lambda-1)}{(\alpha-1)(\gamma-1)\lambda^2-\alpha(\gamma+1)-2\alpha\lambda+\gamma-1}$ which rearranging leads to $c < c_{D2}$.

Lemma 8

Let $d(1, y_G)$ be 12 when the CRA exerts effort and similarly let $d(0, y_G)$ be 12 when the CRA doesn't exert effort. In order for the CRA to prefer to exert effort $d(1, y_G)$ has to be greater than $d(0, y_G)$, in formula $\lambda - c > \frac{\lambda(\alpha(\lambda-1)+(\alpha-1)(\lambda+1)y_G+\lambda+3)}{2(\lambda+1)}$ which rearranging leads to $c < c_{D1}$.

Proof of Lemma 7

When purchasing the final report the entrepreneur pays the fee Φ with probability 1, receives V_G with probability $\frac{\alpha\lambda+\alpha(1-\lambda)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$, and 0 with probability $\frac{(1-\alpha)(1-\lambda)(1-e)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$. Hence the payoff in this case is 5. When asking for a second opinion the entrepreneur pays the cost δ with probability 1, receives V_G and 0 with the same probability of the purchasing case but pays the fee with probability $\frac{\alpha+(1-\alpha)(1-\lambda)^2(1-e)(1-\epsilon)}{\alpha+(1-\alpha)(1-\lambda)(1-e)}$. Hence the payoff in this case is slightly different from 6, namely 10. The entrepreneur chooses to buy if $5 > 10$, namely

$$m > \frac{(1-\alpha)(1-e)(1-\lambda)(1-(1-\lambda)(1-\epsilon))}{\alpha+(1-\alpha)(1-e)(1-\lambda)}$$

where $m = \frac{\delta}{\Phi}$.

Proof of Proposition 2

If $y_G = 1$, for the first CRA to prefer to exert effort instead of not exerting it has to be that Lemma 8 holds. When the first CRA exerts effort, the second CRA never does so (Lemma 1). When Lemma 8 is not satisfied the first CRA prefer not to exert effort. When the first CRA doesn't exert effort, the ENT faced with $P = G$ will choose to ask for the official rating instead of approaching a second CRA if Lemma 7 holds. Moreover by Lemma 9, when $y_G = 1$, the second CRA doesn't exert effort. Thus, there exist an equilibrium of the type $\gamma_1 = 1$, $\gamma_2 = 0$, $y_G = 1$ and an equilibrium of the type $\gamma_1 = 0$, $\gamma_2 = 0$, $y_G = 1$. If $y_G = 0$, the first CRA always prefers not to exert effort (Lemma 9). When the first CRA doesn't exert effort, the ENT faced with $P = G$ will choose to approach a second CRA if Lemma 7 is not satisfied. For the second CRA to prefer to exert effort it has to be that Lemma 6 holds. Hence there exists an equilibrium of the type $\gamma_1 = 0$, $\gamma_2 = 0$, $y_G = 0$ and an equilibrium of the type $\gamma_1 = 0$, $\gamma_2 = 1$, $y_G = 0$.

Proof of Proposition 3

From (14) and ((16)) let $\bar{c} = \lambda(\frac{1}{2} - \alpha)$ and $\tilde{c} = \lambda^2\left(\frac{1-\alpha}{1+\lambda}\right)$ be the values above which the CRA prefers not to exert effort. Start by assuming that $\lambda(\frac{1}{2} - \alpha) > \lambda^2\left(\frac{1-\alpha}{1+\lambda}\right)$, which simplified leads to $\frac{1}{2} < \frac{\lambda+\alpha}{1+\lambda}$. In turn if $\alpha < \frac{1-\lambda}{2}$, then $\bar{c} > \tilde{c}$ meaning that the threshold cost below which the CRA is willing to exert effort is now lower. This in turn implies

that instead if $\alpha > \frac{1-\lambda}{2}$ then $\bar{c} < \tilde{c}$ meaning that the threshold cost below which the CRA is willing to exert effort is now higher.

Proof of Lemma 10

By exerting no effort in the no disclosure regime both contacted CRA's earn

$$\frac{\lambda\left(-\alpha(\lambda+3)+((\alpha-1)\lambda+\alpha+3)y_G+\lambda-5\right)}{2((\alpha-1)\lambda+\alpha+1)y_G-2((\alpha-1)\lambda+\alpha+3)} \tag{17}$$

Under disclosure the payoff for CRA1 and CRA2 becomes respectively

$$\frac{\lambda\left(\alpha(\lambda-1)+(\alpha-1)(\lambda+1)y_G+\lambda+3\right)}{2(\lambda+1)} \tag{18}$$

$$\frac{\lambda(\alpha(\gamma_1-3)\lambda-\alpha(\gamma_1+1)+\gamma_1(-\lambda)+\gamma+\lambda-1)}{(\alpha-1)(\gamma_1-1)\lambda^2-\alpha(\gamma_1+1)-2\alpha\lambda+\gamma_1-1} \tag{19}$$

Start with CRA1. If $y_G = 1$, (17) simplifies to $\frac{1}{2}(\alpha+1)\lambda$ and similarly (18) becomes $\frac{\lambda(\alpha\lambda+1)}{\lambda+1}$. If (18)$>$ (17) it has to be that $-\frac{(\alpha-1)(\lambda-1)\lambda}{2(\lambda+1)} < 0$. This holds $\forall\alpha,\lambda \in \{0,1\}$. If $y_G = 0$ (17) simplifies to $\frac{1}{3}(\alpha+1)\lambda$ and (18) becomes $\alpha\left(\lambda-\frac{1}{2}\right)+\frac{3}{2}$. Once again, if (18)$>$ (17) it has to be that $\frac{1}{6}(\alpha(8\lambda-3)+2\lambda-9) < 0$. As before, this holds $\forall\alpha,\lambda \in \{0,1\}$. Now move to CRA2. If $y_G = 1$ the entrepreneur does not contact CRA2. If $y_G = 0$, for (19)$>$ (17) it has to be that

$$\frac{1}{3}\lambda\left(-\frac{3(\alpha(\gamma_1-3)\lambda-\alpha(\gamma_1+1)+\gamma_1(-\lambda)+\gamma_1+\lambda-1)}{(\alpha-1)(\gamma_1-1)\lambda^2-\alpha(\gamma_1+1)-2\alpha\lambda+\gamma_1-1}+\alpha+1\right) < 0 \tag{20}$$

When $\gamma_1 = 1$, (20) simplifies to $\frac{1}{3}(\alpha-2)\lambda < 0$ which holds $\forall\alpha,\lambda \in \{0,1\}$. When $\gamma_1 = 0$, (20) becomes $\frac{1}{3}\lambda\left(-\frac{3(3\alpha\lambda+\alpha-\lambda+1)}{(\lambda+1)(\alpha\lambda+\alpha-\lambda+1)}+\alpha+1\right) < 0$. Given that $\frac{3(3\alpha\lambda+\alpha-\lambda+1)}{(\lambda+1)(\alpha\lambda+\alpha-\lambda+1)} > 1$, the condition is once again satisfied $\forall\alpha,\lambda \in \{0,1\}$.

Proof of Lemma 11

Recall that $c_{ND} = \frac{(\alpha-1)\lambda((\lambda+1)y_G-\lambda+1)}{2((\alpha-1)\lambda+\alpha+1)y_G-2((\alpha-1)\lambda+\alpha+3)}$,
$c_{D2} = \frac{(\alpha-1)(\gamma-1)(\lambda-1)\lambda^2}{(\alpha-1)(\gamma-1)\lambda^2-\alpha(\gamma+1)-2\alpha\lambda+\gamma-1}$ and $c_{D1} = -\frac{(\alpha-1)\lambda((\lambda+1)y_G+\lambda-1)}{2(\lambda+1)}$.

1. when $y_G = 1$, $c_{ND} > c_{D1}$ simplifies to $\frac{(\alpha-1)(\lambda-1)\lambda}{2(\lambda+1)} > 0$ which holds $\forall\alpha, \in \{0,1\}$.

Similarly, when $y_G = 0$ $c_{ND} > c_{D1}$
simplifies to $\frac{(\alpha-1)(\lambda-1)\lambda(\alpha\lambda+\alpha+4)}{2(\lambda+1)((\alpha-1)\lambda+\alpha+3)}$ which holds $\forall\alpha, \in \{0,1\}$.

2. when $y_G = 0$ and $\gamma_1 = 0$, $c_{ND} > c_{D2}$ simplifies to
$\frac{1}{2}(\alpha-1)(\lambda-1)\lambda\left(\frac{1}{\alpha\lambda+\alpha-\lambda+3} - \frac{2\lambda}{(\lambda+1)(\alpha\lambda+\alpha-\lambda+1)}\right) > 0$ which holds $\forall\alpha \in \{0,1\}$ and for $\lambda < -\sqrt{\frac{\alpha^2+8}{(\alpha-1)^2}} - \frac{3}{\alpha-1}$. This implies that when $\lambda > -\sqrt{\frac{\alpha^2+8}{(\alpha-1)^2}} - \frac{3}{\alpha-1}$ ita has to be that $c_{ND} < c_{D2}$.

Notice also for completeness that when $y_G = 0$ and $\gamma_1 = 1$, $c_{ND} > c_{D2}$ simplifies to

$$\frac{(\alpha-1)(\lambda-1)\lambda}{2((\alpha-1)\lambda+\alpha+3)} > 0$$

which holds $\forall\alpha, \in \{0,1\}$.