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Emergence of Rating Agencies: Implications for Establishing a Regional Rating Agency in Asia

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Abstract

The present analysis sheds light on the setting up a regional rating agency in Asia in the wake of recent financial crisis. We investigate the policy facing a financial regulator while evaluating whether or not to admit new entrants into the credit rating market. In an incomplete contracting framework, we show that an impartial financial regulatory body (represented by a benevolent supranational organization) can facilitate credit ratings of high quality by allowing for the entry of new rating agencies on a non-single basis than it does for a mere single entry. This finding is caused by increased competition among the rating agencies, which induces higher quality of rating services even should rating agencies still exert below their maximum level of efforts.

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1. INTRODUCTION

Credit ratings and agencies in the industry have become an integral part of the global financial markets. Changes in ratings influence stock prices, bond prices, and the credit terms in general. Major global credit rating agencies (GRAs), including Fitch, Inc., Moody's Investors Service (Moody's) and Standard and Poor's Ratings Services (S&P), have become household names and their rating reports often draw attention from politicians and business leaders alike. Despite GRAs being viewed as more credible than domestic rating agencies in most countries, the consequences of their rating actions in the global financial market have been put under close public scrutiny. Several incidences in the credit ratings market have led to this development. First, the collapse of Enron Corporation (Enron) in the US has raised concerns about the potential "conflicts of interest' (Golin 2001; Dittrich 2007). Second, the AAA ratings were incredibly assigned to complex derivative products with little high quality collateral. Third, major global rating agencies even assigned investment-grade ratings to companies just prior to their bankruptcy, (SEC 2003). It is inevitable that reasonable doubt has been cast on the credibility of major rating agencies and their role in leading towards the recent global economic downturn has been highlighted, while discussion of the appropriate policy measures has now been extensively discussed (Bolton, Freixas, and Shapiro 2008)

Indeed, a closer observation of recent developments in the global financial sector, with an emphasis on the failure to warn investors on the risk of complex financial products and on possible corporate collapses of major multinational firms, naturally lead to the following questions: Does the credit rating industry deliver on its promises to enhance the mechanism aiming for sound and effective financial intermediation? How can the debate over ratings quality be reconciled when only three dominant credit rating providers located in the developed countries actually cater to the huge demand for rating services in the presence of divergent economic and financial characteristics amongst regions in the globe? How do the costs of efforts involved in ratings shape the industry structure of credit ratings in the presence of moral hazard?

As a step towards the understanding to these questions, this paper studies the impacts on the quality of ratings when a financial regulator changes its admission policy towards the entry into ratings market of potential rating entrants. By admission of the potential rating entrants, we mean the entry of rating agencies that have country- and/or regional-specific knowledge about business practices in certain locales, in contrast to global agencies, which are instrumental in directing the developments of the industry. In the light of information asymmetry, we develop a simple incomplete contracting model of entry permit issuance with moral hazard. We envisage an environment in which a benevolent regulator (which can be a supranational organization or some accredited organization) oversees the admission into the credit ratings industry. In this framework, potential entrants would apply for an entry permit and negotiate over the entry fees with this organization, and the payment of entry fees would be collected for investment infrastructure improvement. We show non-single entry induces greater competition between the rating agencies, which, in turn, leads to higher ratings quality than it does otherwise even if both rating agencies still exert below their maximum level of efforts.

Perhaps the theoretical paper most related to this paper is Millon and Thakor (1985), which considered credit rating agencies as a form of information gathering agencies (IGAs) and emphasized the important role of information asymmetries and moral hazard. However, this paper differs from theirs in two significant ways. First, unlike Millon and Thakor (1985), we investigate whether or not the organization's capacity, represented by the amount of entry fees determined through negotiations in the presence of information asymmetry, is enhanced due to a change in the opening up of the market of potentially capable rating agencies. Using effort costs as an indication of the level of institutional barrier, we explore

the conditions under which a regional rating agency with country-specific expertise would survive the competition against a global one in the presence of information asymmetry. Second, we consider an effort-inducing mechanism built upon an incomplete contract between the benevolent supranational organization (institutional principal in the present context) and credit rating agency, in contrast to the noisy external monitoring in Millon and Thakor. This paper is also closely related to a recent contribution on strategic licensing in the presence of moral hazard (Schmitz 2007). In contrast to the assumption of zero profit due to Bertrand competition, we consider here a setting where the rating agencies equally share, depending upon their effort level, the total benefits generated from the ratings market, as their efforts demonstrated will determine whether they will be successful in securing rating business from potential clients. We provide here an analytical framework that is general enough to approximate reality and yet simple enough to provide tractable insights.

This paper, therefore, contributes to the discussion on whether or not a reshaping the credit rating industry by allowing for new entrants facilitates the enhancement in the quality of ratings amongst other important policy issues. Moreover, this paper also contributes to the literature in the area of institutional developments for financial sector reform and regional integration by exploring the implications for possible alignment of the financial landscape in Asia as it moves away from reliance upon major agencies outside the region. The paper also helps to identify both policy challenges and opportunities that may emerge for further enhancement of regional integration in Asia through building institutions in instrumental financial services industry, such as the credit rating industries.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature related to the system governing the credit rating agencies in the globe. Section 3 contains an analytical model of strategic rating agency admission with moral hazard in the presence of incomplete information. Section 4 discusses the main findings, and Section 5 concludes.

2. LITERATURE REVIEW

There is a large body of literature, both theoretical and empirical, on credit ratings and their roles in international financial markets. Previous research along this line can be divided into three branches: The first branch discussed the quality of ratings and addresses the question of whether or not the measurement in the quality of ratings meaningfully reflects what they are supposed to measure (Hickman 1958; Ang and Patel 1975; and Kao and Wu 1990). The second branch examined whether or not ratings reports qualitatively convey information that the market has not already incorporated into prices from other available information (Katz 1974; Grier and Katz 1976; Ingram, Brooks, and Copeland 1983; Weinstein 1977). For example, Hand, Holthausen, and Leftwich (1992) found that ratings do contain information beyond what is publicly available. The third branch analyzed how the rating agencies use public information in setting the quality of ratings (Kaplan and Urwitz 1979; Ederington 1985; Lonski 1992; Grundy 1997; Pender 1992).

Departing from these theoretical concerns, Blume, Lim, and Mackinlay (1998: 1839–90) studied the credit ratings market and attributed the downward trend in the quality of ratings in the United States due, in part, to changing standards. Ferri, Liu, and Stiglitz (1999) investigated the informational value embedded in the sovereign rating of credit rating agencies. They found that sovereign credit ratings were pro-cyclical for the East Asian crisis-hit economies during the 1997 financial crisis. Therefore, the authors argue that credit rating agencies appear to have aggravated the East Asian crisis by downgrading East Asian crisis countries more than the worsening in these countries' economic fundamentals would have justified.

Another strand of credit ratings literature, using the analytical framework of game theory, focused on the role of information intermediaries. For example, studies by Morgan and Stocken (2003) and Kartik (2008). Kartik, Ottaviani, and Squintani (2007) belong to this line

of research by using signaling games in which a sender faces a cost of lying. Inderst and Ottaviani (2008) examined the impact on information revelation of strategic contracting between the sender and the receiver. They focus on a principal's problem in providing incentives to a sales agent so as to simultaneously prospect for customers and advise customers on the product's suitability. Similarly, Bolton, Freixas, and Shapiro (2007) consider strategic contracting when the senders are setting prices for their products while providing suggestions to the uninformed investors.

With regard to the literature on the implications of ratings shopping, Faure-Grimaud, Peyrache, and Quesada (2006) investigated corporate governance ratings in a market with truth-telling credit rating agencies and rational investors. They showed that competition between rating agencies can lead to less information disclosure. Farhi, Lerner, and Tirole (2008) considered that information intermediaries (such as ratings agencies) can provide various types of verifiable information and investigate the impacts of market structure on the ratings shopping behavior by the rated entity (either firms or individuals).

3. THE BASIC MODEL

The setup of the model consists of two risk-neutral parties, a regulator (represented by a benevolent supranational organization) and a group of credit rating agencies. The supranational organization (principal) issues permit to the rating agency (agent) in accordance with the standards governing the provision of rating services.[1] Each rating agency *i*, where *i* = 1, 2, … , *n*, is potentially capable of providing rating services which allows its client (the issuer) to acquire capital (e.g. issue bonds), provided these rating agencies obtain a permit from the supranational organization. An agency that obtains a permit decides its effort level in providing ratings report of high quality, which in turn facilitates its market share in the ratings industry as long as the issuers successfully acquire funding from the capital markets. Denote by *z* the outcome of whether or not an issuer acquires capital. If *z* = 1, the issuer does. If *z* = 0, it does not. *k* is the total number of rating agencies whose clients successfully acquire capital given the agent's effort. *R* is the size of total net benefits (profits) of the credit ratings market.

The expected share of net benefit to each agency *i* is given by $s_i = \left[\sum_{k=1}^{n} \frac{1}{k}\binom{n-1}{k-1} z^k (1-z)^{n-k}\right] R$.[2] In this set up, an agency enjoys the monopoly benefit ($R > 0$) if only one agency is successful in providing the services for securing the funding needs. Otherwise, the total benefit is equally split amongst the agencies, and each agency obtains an expected share *s* when there are *k* out of *n* agencies successfully assists the issuers in acquiring the capital. An alternative explanation of the current setting can be provided if we interpret agency *i* as a local rating agency, instead of one of the global rating agencies. Indeed, when agency *i* adopts the guidelines set out by the supranational organization, the policy issue of encouraging the credit ratings industry becomes evident as the fees schedule now serves as one form of the policy instrument.

We assume that a rating agency's effort, which is a hidden action, determines whether or not the issuer can successfully secure rating business from its potential client, and that the

1 We consider as an equilibrium outcome the existence of a supranational organization, subsequent to the recent failure of major global rating agencies in predicting corporate collapses. Naturally, the issue of moral hazard in the analytical framework of agency theory captures an important aspect of possible consensus in reaching multilateral agreement within the context of regional cooperation for the emergence of new local rating agencies.

2 Without the loss of generality, we have assumed that each rating agency provides its services only to a single client (the issuer). Nonetheless, this simple characterization can easily be extended to a more general situation of multiple clients.

issuer can succeed with probability p_H if the agent works hard, and with probability $p_L \in (0, p_H)$ if the agent shirks.[3] Denote by *c* the agent's disutility of exerting effort.

All parties are assumed to be risk-neutral and wealth-constrained (see Innes [1990]). It is obvious that a rating agency can only pay the permit fee when it earns a positive benefit $s_i R$ with expected share *s*, i.e., $t \le s_i R$.[4] We assume that the permit fee is determined through the negotiations between the supranational organization and the rating agency. The supranational organization alone cannot heighten competition in the credit ratings market by prescribing prices for the ratings services (see Katz and Shapiro [1986]).

The structure of the negotiations over permit fee is as follows. First, the supranational organization announces a schedule of permit fees, which the rating agencies can accept or reject. If an agency rejects the fee schedule, it obtains no permit and, thus, its net benefit is zero. An agent who has accepted the fee schedule and is granted a ratings permit then decides whether or not to exert effort. Finally, the agent's profits are realized and payment to the supranational organization is made.

In order to bring out the message in a simple manner, we shall consider, in the following analysis, an environment in which there are two credit rating agencies *i* and *j*, where $i \neq j$, and each faces an effort cost of c_i. We assume $c_i = c_j = c$ for simplicity. Two scenarios are considered. In scenario I, all elements of the model are assumed to be verifiable, i.e., there is symmetric information. In scenario II, the decision of an agent whether or not to exert effort is a hidden action, i.e., there is information asymmetry, which leads to moral hazard. The main purpose of our analysis is to provide insights into the following questions: Should this supranational organization admit one agent entry into the ratings market or should both agents obtain permits? In the latter case, both credit rating agencies might be successful in helping raise funds, so that competition at the credit ratings market would lead to smaller profits.

3.1 Analysis of Single Permit

Assume first that the principal organization (or principal) issues an exclusive permit to one rating agency. Let *e* represent whether ($e = 1$) or not ($e = 0$) the agent exerts effort.[5] In scenario I, the fees schedule $t^I(s; e)$ announced by the organization is conditional upon *s* and *e*. The agent's budget constraint implies $t^I(s; e) \le sR$ must hold. Clearly, for any effort level *e*, the agent is willing to participate if the expected revenue minus effort costs is non-negative, i.e.,

$$\Pi = E[sR - t^I(s, e)\big|e] - ec \ge 0. \quad (1)$$

An intuitive interpretation of Equation (1) linking the present analysis to practical policy concerns can be provided as follows. If we interpret *c* as the cost of entry reflecting the floor requirements set out by the regulator, and *t* as a fee schedule capturing the scale of payment paid to the regulatory agency, then Equation (1) implies the benevolent supranational organization can induce the effort of credit rating agency through its design of

3 For simplicity, we assume that if both agents obtain permits, whether agent i is successful or not is independent of agent j, where $j \neq i$.

4 Note that fixed fees for employing the credit ratings services are considered regardless of the success of the issuer, since an issuer always has to incur some costs.

5 The qualitative result holds even when we consider a continuous level of effort $e_i \in [0,1]$, where $i = H, L$.

fee schedule while taking into account the agency's performance in facilitating access to capital for her client and her effort level.

It is clear that the agent accepts a fee schedule of $t^I(1, e) = R$ and $t^I(0; e) = 0$ when it implements low effort since

(a) $p_L[1 \cdot R - t^I(1, 0)] + (1 - p_L)[0 \cdot R - t^I(0, 0) \geq 0$, i.e. $R \geq t^I(1, 0)$.

(b) $p_H R - p_H \cdot t^I(1, 1) - (1 - p_H) \cdot t^I(0, 1) - c \leq 0$, i.e. $t^I(1; 1) \geq R - c / p_H$, and

(c) $(a) \geq (b)$, that is, $p_L[1 \cdot R - t^I(1, 0)] \geq p_H R - p_H t^I(1, 1) - c$.

It follows that (a) must bind and, thus, $t^I(1; 0) = R$.

And if the agent implements high efforts, the participation constraint implies

(d) $p_H R - p_H \cdot t^I(1, 1) - (1 - p_H) \cdot t^I(0, 1) \geq c$, i.e. $R - c / p_H \geq t^I(1; 1)$;

(e) $p_L[1 \cdot R - t^I(1, 0)] + (1 - p_L)[0 \cdot R - t^I(0, 0) \leq 0$, i.e. $R \leq t^I(1, 0)$; and

(f) $(d) \geq (e)$, that is, $p_L[1 \cdot R - t^I(1, 0)] \leq p_H R - p_H t^I(1, 1) - c$.

It is easy to verify that (d) must bind, implying that $t^I(1; 1) = R - c / p_H$, which allows for (f) to sustain.

In the presence of information asymmetry (scenario II), the fees schedule $t^{II}(s)$ is no longer conditional on *e*. The budget constraint suggests that $t^{II}(s) \leq sR$. For any effort level *e* implied by the fees schedule, the agent's participation constraint $\Pi = E[sR - t^{II}(s)] - ec \geq 0$ must hold. It is evident that the agent offers $t^{II}(s) = sR$ if it implements low effort since

(g) $p_L[1 \cdot R - t^{II}(1)] + (1 - p_L)[0 \cdot R - t^{II}(0) \geq 0$, i.e. $R \geq t^{II}(1)$,

(h) $p_H R - p_H \cdot t^{II}(1) - (1 - p_H) \cdot t^{II}(0) - c \leq 0$, i.e. $t^{II}(1) \geq R - c / p_H$, and

(i) $(g) \geq (h)$, namely, $p_L[1 \cdot R - t^{II}(1)] \geq p_H R - p_H t^{II}(1) - c$.

It follows that condition (g) must bind, and we have $t^{II}(s) = sR$.

Furthermore, the agent's incentive compatibility constraint, read as

$$E[sR - t^{II}(s) \mid e = 1] - c \geq E[sR - t^{II}(s) \mid e = 0], \quad (2)$$

must hold, which together with budget constraint implies participation. Note that Equation (2) can be alternatively expressed as

$$p_H[1 \cdot R - t^{II}(1)] + (1 - p_H)[0 \cdot R - t^{II}(0)] - e \geq p_L[1 \cdot R - t^{II}(1)] - (1 - p_L)t^{II}(0).$$

It is straightforward to verify that an agent accepts a fee schedule of $t^{II}(0) = 0$ and $t^{II}(1) = R - c/(p_H - p_L)$.

3.2 Analysis of Non-single Permit

Now, consider that the supranational organization issues permits to two agents i, $j = 1, 2$, and $i \neq j$. Let $s_i \in \{0; 1\}$ indicate whether or not the client (the issuer) of agent

i successfully acquires his funding needs and let $e_i \in \{0;1\}$ indicate whether agent *i* exerts effort.

In scenario I, denote by $t_i^{\ I}(s_i, s_j; e_i, e_j)$, where $j \neq i$, the fees schedule offered by the supranational organization. The budget constraint of an agent implies that

$$t_i^I(s_i, s_j; e_i, e_j) \leq s_i \cdot R, \tag{3}$$

where $s_i = \sum_{k=1}^{n} \frac{1}{k}\binom{n-1}{k-1} z_i^k (1-z_i)^{n-k}$, Equation (3) must hold and, for effort levels e_1 and e_2, the participation constraints now read as

$$\Pi = E\left\{\left[\sum_{k=1}^{2} \frac{1}{k}\binom{1}{k-1} z_i^k (1-z_i)^{2-k}\right] R - t_i^{\ I}(s_i, s_j; e_i, e_j) \middle| e_1, e_2\right\} - e_i c \geq 0.$$

Clearly, if the agent chooses to implement low effort, then the fee schedule is such that $t_i^I(s_i, s_j; e_i, e_j) = \left[\sum_{k=1}^{2} \frac{1}{k}\binom{1}{k-1} z^k (1-z)^{2-k}\right] R$ since

$$P_L \cdot \left\{\pi\left[\frac{1}{2} \cdot R - t_i^I(1,1;0,e_j)\right] + (1-\pi)\left[1 \cdot R - t_i^I(1,0;0,e_j)\right]\right\} +$$

(j)

$$(1-P_L)\left\{\pi\left[0 \cdot R - t_i^I(0,1;0,e_j)\right] + (1-\pi)\left[0 \cdot R - t_i^I(0,0;0,e_j)\right]\right\} \geq e_i c \quad ,$$

$$P_H \left\{\pi\left[\frac{1}{2} \cdot R - t_i^I(1,1;1,e_j)\right] + (1-\pi)\left[1 \cdot R - t_i^I(1,0;1,e_j)\right]\right\} \cdot +$$

(k)

$$(1-P_H)\left\{\pi\left[0 \cdot R - t_i^I(0,1;1,e_j)\right] + (1-\pi)\left[0 \cdot R - t_i^I(0,0;1,e_j)\right]\right\} \leq e_i c \quad \text{, and}$$

(l) $(j) \geq (k)$, that is,

$$P_L\left\{R(1-\pi/2) - \pi \cdot t_i^I(1,1;0,e_j) - (1-\pi) \cdot t_i^I(1,0;0,e_j)\right\} +$$
$$(1-P_L) \cdot \pi\left\{R - t_i^I(0,1;0,e_j)\right\} \geq e_i c$$

is greater than

$$P_H\left\{R(1-\pi/2) - \pi \cdot t_i^I(1,1;1,e_j) - (1-\pi) \cdot t_i^I(1,0;1,e_j)\right\} +$$
$$(1-P_H) \cdot \pi\left\{R - t_i^I(0,1;1,e_j)\right\} \leq e_i c$$

Clearly, Condition (j) must bind and, thus, we have $t_i^I(s_i, s_j; e_i, e_j) = \left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R$, More specifically, $t_i^I(1,1;0,e_j) = R/2$; $t_i^I(1,0;0,e_j) = R$; $t_i^I(0,1;0,e_j) = 0$; and $t_i^I(0,0;0,e_j) = 0$. This result indicates that the agents equally share the total benefit in the ratings market should they both succeed.

And if the agent exerts honestly high effort, it would only accept a fee schedule of $t_i^I(0,s_j;e_i,e_j) = 0$, $t_i^I(1,0;1,e_j) = R - \frac{c}{p_H(1-\pi)}$, $t_i^I(1,0;0,e_j) = R$ and $t_i^I(1,1;1,e_j) = \frac{R}{2} - \frac{c}{p_H \cdot \pi}$, where $\pi = \begin{cases} p_H, e_j = 1 \\ p_L, e_j = 0 \end{cases}$.

In scenario II, denote the fees from agent *i* by $t_i^{II}(s_i;s_j)$, so that the budget constraints imply $t_i^{II}(s_i,s_j) \le \left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R$ and the participation constraints are

$$\Pi = E\left\{\left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R - t_i^{II}(s_i,s_j)\middle|e_1,e_2\right\} - e_i c \ge 0. \quad (4)$$

If agent *i* implements low effort, then it accepts a fees schedule of $t_i^{II}(s_i,s_j) = \left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R$.

If the agent implements high effort, then the incentive compatibility constraints implies the fees schedule is such that $t_i^{II}(0,s_j) = 0$, $t_i^{II}(1;0) = R - \frac{c}{(p_H - p_L)(1-\pi)}$, and $t_i^{II}(1;1) = \frac{R}{2} - \frac{c}{(p_H - p_L)\cdot\pi}$ (see Appendix).

Before presenting the main findings, we highlight the impact on effort cost of incomplete information a la Laffont and Martimort (2002). Lemma 1 below summarizes the results obtained in the previous analysis on the fee schedule.

Lemma 1

For any $p_H \in [0,1]$, $p_L \in [0, p_H]$ and $c \in (0,1)$, the cost of effort under complete information and incomplete information is given by

$$\varphi(c) = \begin{cases} c & \text{, if effort is verifiable,} \\ \frac{p_H}{p_H - p_L}c & \text{, if effort is hidden.} \end{cases}$$

The proof is trivial, and, hence, omitted..

Lemma 1 suggests that the cost of effort to agent i is adjusted upwards under incomplete information.

3.3 Main Results

We now summarize, in Proposition 1, the fee revenue to the principal under complete information and incomplete information.

Proposition 1

For any $p_H \in [0,1]$, $p_L \in [0, p_H]$, $c > 0$ *and* $\varphi(c) \geq c$,

if the principal issues permit to only one agent, her expected profits are given by

$$\Pi^{ex}(e) = \begin{cases} p_L \cdot R, & if\ e = 0, \\ p_H R - \varphi(c), & if\ e = 1. \end{cases} \quad ; \text{and}$$

if the principal issues permits to two agents, then her expected profits are given by

$$\Pi^{non-ex}(e_1, e_2) = \begin{cases} p_L(2 - p_L)R, & if\ e_1 = e_2 = 0, \\ [p_H + p_L - p_H p_L)]R - \varphi(c), & if\ e_i = 0, e_j = 1, . \\ p_H(2 - p_H)R - 2\varphi(c), & if\ e_1 = e_2 = 1. \end{cases}$$

An important message emerging from Proposition 1 suggests that the agent can enjoy rent when it implements high effort under incomplete information, while the principal can always extract the expected total surplus under complete information.

Proposition 2 below characterizes the principal's optimal strategies of issuing entry permits.

Proposition 2

For any $p_H \in [0,1]$, $p_L \in [0, p_H]$ and $\varphi(c) \in (0,1)$,

(a). If $p_H \leq 1/2$, then the supranational organization always issues permits to two agents. Both agents exert high effort if $\varphi(c) < (p_H - p_L)(1 - p_H)R$, both agents exert low effort if $\varphi(c) > (p_H - p_L)(1 - p_L)R$, while one agent exerts low effort and the other high effort otherwise.

(b) If $p_L \geq 1/2$, then only one agent obtains permit. High effort is exerted for any $\varphi(c) \leq (p_H - p_L)R$, and low effort otherwise.

(c) If $p_L < 1/2 < p_H$, then the supranational organization issues permit only to one agent and it exerts high effort for any $\varphi(c) \leq [p_H - p_L(2 - p_L)]R$, and both agents obtain permits and exert low effort otherwise.

Proof

Using the results contained in Proposition 1, compare the principal's payoffs under the scenario of non-single agents, it is evident the principal issues a permit to two agents and both exert high effort when $\varphi(c) < (p_H - p_L)(1 - p_H)R$, and both exert low effort when $\varphi(c) > (p_H - p_L)(1 - p_L)R$. Moreover, in the scenario of single agent, subtract the principal's payoffs under low effort from that under high effort, it is clear that a single permit is issued to the agent which exerts high effort if $\varphi(c) > (p_H - p_L)(1 - p_L)R$, and low effort otherwise. Finally, compare the principal's payoffs under two scenarios, and subtract its payoffs under high effort with single agent and low effort with non-single agent, it follows that the permit is issued to only one agent and it exerts high effort if $\varphi(c) \leq [p_H - p_L(2 - p_L)]R$, and to two agents and both exert low effort otherwise.

Interestingly, when the effort costs are sufficiently large, it is in the interest of the principal to issue permits to two agents even though both exert low effort, while the principal issues permit to a single agent and it exerts high effort when the effort cost is sufficiently low. This result can be interpreted with reference to the standard cases of (a) and (b) in Proposition 2. Intuitively, in order to increase the probability that the issuer successfully acquires capital and thus, the information rent, it is always in the principal's interest to issue permits to provide licenses to both agents even though high effort may still lead to a relatively small success probability (case (a)). In contrast, it is optimal to issue permit to one single agent even though low effort can lead to a relatively large success probability (case (b)).

4. DISCUSSION

We now discuss the effect of moral hazard, the effect of changes in the effort costs on the principal's strategy of permit issuance.

4.1 The Effect of Moral Hazard

A straightforward comparison of the payoffs to a benevolent supranational organization under two regimes of information structure illustrates the effect of moral hazard. It is instructive to note that for any $p_L < 1/2 < p_H$, if $\frac{p_H - p_L}{p_H}[p_H - p_L(2 - p_L)]R < c < [p_H - p_L(2 - p_L)]R$, then the principal issues permits to two agents in the presence of moral hazard, while only a single agent obtains permit under symmetric information. Hence, there are situations in which more permits are issued due to moral hazard. And we have, thus, shown an interesting result in contrast to those obtained in the literature.

4.2 Changes in Effort Cost

Notice that, for any $p_L < 1/2 < p_H$, the principal's permit-issuing strategy depends upon the agent's effort cost $c \in (c_1, c_2)$, where $c_1 = \frac{p_H - p_L}{p_H}[p_H - p_L(2 - p_L)]R$ and $c_2 = [p_H - p_L(2 - p_L)]R$. Denote by $c^b = c \in (c_1, c_2)$ as a benchmark. It is instructive to note the result holds when an increase in effort cost to c^p from c^b such that $c^p - c^b \in ((c_3 - c_1), (c_4 - c_2))$, where $c_4(p_H, p_L) > c_2(p_H, p_L)$, $c_3(p_H, p_L) > c_1(p_H, p_L)$ and $(c_4 - c_2) > (c_3 - c_1)$. Hence, depending on the constellation of parameters p_L and p_H, it need not always be in the principal's interest to issue non-single permits to two agents under moral hazard.

5. CONCLUSION

In the present analysis, we have studied the problem of single versus non-single entry permit facing a benevolent supranational organization. We developed an analytical framework of incomplete contracting in which an agent negotiates with the principal on the fee schedule for obtaining a permit. We have demonstrated that there are conditions in which it is in the principal's interest to issue permits to non-single agents even though they exert efforts below their maximum level. We have assumed that the fee schedule is a bargaining outcome between the principal and the agents under information asymmetry.

The policy implications of the result obtained here can provide important insights into whether or not the admission into credit rating market of a new entrant agency can generate greater benefits for investment infrastructure capacity building. The results may be particularly useful when considering, for example, the entry of a regional credit rating agency. In fact, if we approximate the regional credit rating agency's expertise on local business practices as the indication of the extent to which the quality of its report facilitates the access to capital of the issuer, then the present analysis suggests that a supranational organization could always benefit from admitting into the industry of more than one single rating agency in the presence of moral hazard. This first result provides a justification for undertaking steps towards institutional realignment in incorporating into the industry of regional credit rating agency. Further, our findings can also contribute insights into the discussion on whether or not an investor payment regime is better than an issuer payment system in overcoming the "conflict of interest" as raised by the critics. Clearly, the fee schedule in the present analysis represents a performance-based outcome of negotiation between the supranational organization and the rating agency. In the presence of incomplete information, if we interpret the permit fee as an indication of the effort level that a supranational organization intends to induce, then the fee schedule reflects the extent to which the rating agency exerts effort in delivering a quality rating report. The second result offers an explanation for possible reformulation in the payment system for the rating services. Our analysis also sheds light on role of institutional/regulatory barriers in affecting the effort levels of the competing rating agencies. Using effort costs as a proxy for the costs of the regulatory barrier, we have shown the conditions under which a regional credit rating agency survives the competition against a global one. The third result underpins the theoretical support for the case of setting up regional credit rating institution in Asia. It is important to note that the present analysis provides the theoretical backbone for policy recommendation in promoting practical subject matters such as Asian Bond Market Initiative, in particular, when the notion of equilibrium is agreed upon the recent failure of global credit ratings agencies in predicting corporate collapses.

Although the present model has not explicitly investigated the welfare implications, the treatment of supranational organization setting up guidelines in permit issuances, which allows for the admission of credit rating agencies in different regions suffices to serve as proxy for the implications of welfare in each distinct region. Nonetheless, the present analysis has not been able to provide policy recommendations on issues of ratings shopping and the precision of credit rating agencies' evaluation models. We believe there are broad avenues for further research into these important policy issues for the development of credit rating industry.

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APPENDIX

Under scenario I, if agent *i* implements high effort level ($e_i = 1$), given her rival's effort level e_j, her expected payoff is given by

$$\pi = E\left\{\left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R - t_i{}^I(s_i, s_j; e_i, e_j)\middle| e_1, e_2\right\} - e_i c \geq 0.$$

More specifically,

$$P_H\left\{\pi\left[\frac{1}{2}\cdot R - t_i^I(1, 1; 1, e_j)\right] + (1-\pi)\left[1\cdot R - t_i^I(1, 0; 1, e_j)\right]\right\} +$$

$$(1-P_H)\left\{\pi\left[1\cdot R - t_i^I(0, 1; 1, e_j)\right] + (1-\pi)\left[0\cdot R - t_i^I(0, 0; 1, e_j)\right]\right\} \geq e_i c$$

That is,

$$P_H R - P_H\cdot\pi\cdot t_i^I(1, 1; 1, e_j) - P_H\cdot(1-\pi)\cdot t_i^I(1, 0; 1, e_j) -$$

$$(1-P_H)\cdot\pi\cdot t_i^I(0, 1; 1, e_j) - (1-P_H)(1-\pi)\cdot t_i^I(0, 0; 1, e_j) \geq e_i c$$

It is easy to verify that $t_i^I(0, s_j; e_i, e_j) = 0$, $t_i^I(1, 0; 1, e_j) = R - \dfrac{c}{p_H(1-\pi)}$, $t_i^I(1, 0; 0, e_j) = R$ and $t_i^I(1, 1; 1, e_j) = \dfrac{R}{2} - \dfrac{c}{p_H\cdot\pi}$, where $\pi = \begin{cases} p_H, e_j = 1 \\ p_L, e_j = 0 \end{cases}$.

In scenario II, denote the fees from agent *i* by $t_i{}^{II}(s_i; s_j)$, so that the budget constraints imply $t_i^{II}(s_i, s_j) \leq \left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R$ and the participation constraints are

$$\pi = E\left\{\left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R - t_i{}^{II}(s_i, s_j)\middle| e_1, e_2\right\} - e_i c \geq 0.$$

If agent *i* implements low effort, it is evident the fee schedule is given by $t_i^{II}(s_i, s_j) = \left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R$.

If agent *i* implements high effort, then the incentive compatibility constraints

$$E\left\{\left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R - t_i{}^{II}(s_i, s_j)\middle| 1, e_j\right\} \geq$$

$$E\left\{\left[\sum_{k=1}^{2}\frac{1}{k}\binom{1}{k-1}z_i^k(1-z_i)^{2-k}\right]R - t_i{}^{II}(s_i, s_j)\middle| 0, e_j\right\}$$

must hold, which also ensure participation. Note that the incentive compatibility can be written as

$$\left[\begin{array}{l} p_H(1-\pi)\left[R-t_i^{II}(1,0)\right]+\ p_H\pi\left[R/2-t_i^{II}(1,1)\right]+ \\ (1-p_H)\pi\left[0-t_i^{II}(0,1)\right]+(1-p_H)(1-\pi)\left[0-t_i^{II}(0,0)\right] \end{array}\right]-c_i \geq$$

$$\left[\begin{array}{l} p_L(1-\pi)\left[R-t_i^{II}(1,0)\right]+\ p_L\pi\left[R/2-t_i^{II}(1,1)\right]+ \\ (1-p_L)\pi\left[0-t_i^{II}(0,1)\right]+(1-p_L)(1-\pi)\left[0-t_i^{II}(0,0)\right] \end{array}\right]$$

which can be expressed as

$$(p_H-p_L)\left[(1-\pi)(R-t_i^{II}(1;0)-t_i^{II}(0;0))+\pi(R/2-t_i^{II}(1;1)-t_i^{II}(0;1))\right]\geq c\,.$$

Hence, the fees schedule is such that $t_i^{II}(0,s_j)=0$, $t_i^{II}(1;0)=R-\dfrac{c}{(p_H-p_L)(1-\pi)}$, and $t_i^{II}(1;1)=\dfrac{R}{2}-\dfrac{c}{(p_H-p_L)\cdot\pi}$.