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## **Monitoring versus Gatekeeping**

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# Monitoring versus Gatekeeping

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## Abstract

We study alternative mechanisms facing adverse selection and moral hazard, as well as the problems of collusion and free-riding, which are often ignored in the literature. We derive the optimal monitoring mechanism and show that it solves free riding and collusion problems. However, with different types of agents, the optimal mechanism needs to also solve an “assignment problem,” which, coupled with the need to generate incentive for monitoring, prevents the optimal monitoring mechanism from attaining full second best efficiency. The paper then considers an alternative mechanism in which some agents are simply given gatekeeping powers: they can either allow or block any investment project. The mechanism allows rent extraction through side payments from investors to the gatekeepers. A gatekeeping mechanism with competing gatekeepers attains first best efficiency, and is also proof against collusion between investors and gatekeepers by construction.

We show that the crucial issue for the success of monitoring is whether monitors can be penalized for false reporting. Without this assumption monitoring reduces to gatekeeping. Further, the crucial assumption for gatekeeping to succeed is that gatekeepers behave in a competitive manner. The results provide an explanation for the observed institutional choices: monitoring is typical in informal collectives, whereas government regulation of investment (licensing, issuing permits etc) leads naturally to gatekeeping.

KEYWORDS: *Monitoring; Gatekeeping; Informal credit collective; Licensing; Collusion; Free riding in monitoring; Corruption*

JEL CLASSIFICATION: O12, D82, D78

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# 1 INTRODUCTION

Monitoring mechanisms are in widespread use in informal credit institutions.<sup>(2)</sup> If an investor has private information on factors affecting the outcome of a project, the optimal individual investing decision might not be efficient, creating scope for socially useful costly monitoring of the investment decision by other agents. We study the problem of optimal monitoring design and show how agents can be endogenously assigned to the roles of investors and monitors, how any potential free rider problems in monitoring can be solved, how monitors can be induced to carry out costly monitoring, and identify the condition crucial for the success of this mechanism.

While the monitoring mechanism is the usual focus of the literature on informal collectives, we show that the problem of ensuring efficient investment has an alternative solution. We construct a mechanism in which some agents are simply given gatekeeping powers: they can either permit or block any investment project. The mechanism allows rent extraction through side payments from investors to the gatekeepers. Such mechanisms are widely observed in the context of public regulatory bodies and concomitant rent extraction. When governments regulate investment, agents who issue licenses, permits etc. act as gatekeepers, and in a corrupt system, extract side payments.

We show that an optimally designed gatekeeping mechanism achieves first best efficiency and outperforms optimal monitoring. This shows that even for informal collectives, monitoring is not necessarily the best solution, and also shows that corruption is not necessarily a detriment to efficient investment.

However, this also begs a question about observed institutional choice: monitoring is typical in informal collectives, whereas government regulated investment leads naturally to gatekeeping. We show that the crucial issue for the success of monitoring is whether monitors can be penalized for false reporting, and that for gatekeeping is whether gatekeepers can be induced to behave in a competitive manner. Next, the advantage of gatekeeping over monitoring vanishes if the cost of monitoring goes to

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<sup>(2)</sup>The term “informal” denotes a variety of credit arrangements that rely on self-enforcement rather than on formal contracts enforced by external agents such as courts of law. Such institutions can have detailed rules, and adherence is often ensured through incentives born of social interactions. Examples include credit cooperatives, group loans, and rotating savings and credit associations.

zero. Further, if monitors cannot be effectively penalized, monitoring reduces to gatekeeping, so that the latter is the only possible system. Finally, if the monitors can be penalized, optimal monitoring is proof against collusion either among monitors or between monitors and investors. The gatekeeping mechanism, on the other hand, explicitly allows side payments from investors to gatekeepers and therefore there are no further concerns about collusion between these groups. However, if gatekeepers can themselves collude, the gatekeeping mechanism performs poorly, dissipating investment incentives.

These factors shed some light on the observed institutional choice. Typically, informal collectives arise in settings in which agents have strong social connections. This makes it possible to have a strong center. But equally, this allows the possibility of collusion between agents. The monitoring mechanism is unaffected by any type of collusion, and if gatekeepers can collude, monitoring is the better choice. Therefore if the cost of monitoring is not very high, and there is a possibility of collusion, the advantage from the collusion-proofness of monitoring is likely to outweigh its disadvantages.

The results also have implications for the study of corruption. In a pioneering series of articles collected in Shleifer and Vishny (1998), the authors characterize government failures as “grabbing hand,” distinct from “helping hand.” One aspect of the former is corruption, which Shleifer and Vishny (1993) define as the sale by government officials of government property for personal gain (e.g. the collection of bribes for issuing permits). Such studies implicitly assume that a gatekeeping mechanism is in place, and analyze the distortions arising from it. As we noted above, if the implementing centre is itself weak, the monitoring mechanism coincides with the gatekeeping mechanism. Thus the only mechanism available to a weak government (which is unable to take monitors to task) is gatekeeping, and therefore this system is the natural setting for the analysis of corruption. Shleifer and Vishny (1993) argue that weak governments cannot, at any reasonable cost, prevent rent extraction by government agencies in issuing complementary permits.<sup>(3)</sup> They note that if these agencies can freely enter, they drive the cumulative burden of bribe on an investor high enough to preclude investment. The results here show that the problem can be solved if gatekeepers have competitors (i.e. several agents can issue a license, permit etc.). We show that under competitive gatekeeping, the optimal mechanism solves the allocation problem so that the right

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<sup>(3)</sup>See also Murphy et al. (1993).

agents have an incentive to invest and others become gatekeepers, and further, the mechanism induces the investors to invest in an efficient manner. Thus the best option for a weak government might be to induce competition among corrupt agents rather than try to remove corruption. However, if gatekeepers can collude, we get back the Shleifer-Vishny result - gatekeeping dissipates investment incentives.

Let us now clarify the model and the results in greater detail. We consider a setting with a continuum of agents. Each agent has a project which, if invested in, can either succeed or fail. The probability of success of a project depends on both the type of a project and on whether the agent puts in an effort. Project type is drawn from a uniform distribution on the unit interval. Both type and effort of an agent is private information, and each agent must decide whether to invest.<sup>(4)</sup>

First, consider the problem of designing a monitoring mechanism. In a collective organization using a monitoring mechanism, each agent could either become a non-borrowing member (i.e. decide to not invest and potentially serve as monitor), or an investor. Once agents choose their roles, investors learn their own cost of putting in an effort, which could be high or low. High cost makes effort unprofitable, but no effort is inefficient. Efficiency requires that only types above a certain cutoff invest, do so only when they have a low cost of effort, and put in an effort. The role of a monitor is to learn (by incurring a cost) the cost of effort for an investor and report back to the centre, which then decides whether to approve a loan to the investor.

Investment, to be worthwhile, must pay at least as much as monitoring, and types below a cutoff should have the incentive to become non-borrowing members and serve as monitors. The division of agents between investors and potential monitors is thus endogenous, and the payoff structure needs to be designed carefully to avoid inefficient investment. We refer to this adverse selection problem of dividing agents between investors and non-borrowing members as the "*assignment problem*."

An optimal monitoring mechanism must satisfy individual rationality and budget balance, and implement an efficient assignment of agents to roles of investors and moni-

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<sup>(4)</sup>As Ghatak and Guinnane (1999) point out, there are four major problems facing lenders - gaining knowledge about the quality of borrowers (adverse selection), ensuring correct choice of effort once the loan is made (moral hazard), learning about the outcome of investment (costly state verification), and enforcement of repayment. This paper focuses on the first two problems, and assumes that the outcome of investment is observable, and repayments enforceable.

tors. We assume that the center is “strong” in the sense that there are social sanctions available so that if monitors who submit false reports can be punished. This ensures that monitors cannot falsely report high cost. However, they could still choose not to monitor and report low cost. Thus the mechanism must also induce monitors to undertake (costly) monitoring. Finally, if collusion among monitors or between monitors and investors is possible, the mechanism must also be collusion-proof.

We characterize the optimal monitoring mechanism and show that it is proof against collusion among monitors as well as between monitors and investors. The mechanism assigns a single monitor for each investor, which preempts free-riding problems. Given that monitoring is costly, the best possible outcome under monitoring is second best. While an optimal mechanism is collusion-proof, it turns out that solving the assignment problem, coupled with the need to provide incentive to monitor, requires sacrificing efficiency in some cases. Thus the optimal monitoring mechanism fails to attain second best efficiency. However, at the limit as the cost of monitoring goes to zero, the incentive-to-monitor constraint ceases to matter, and first best efficiency is attained.

Next, suppose the strong center assumption is removed, so that monitors can ask investors for a bribe to submit a favorable report. In this case monitors effectively become gatekeepers and it is better to design a gatekeeping mechanism taking this possibility into account explicitly.

In a gatekeeping mechanism, each investor requires a permit from a gatekeeper to invest, and a gatekeeper can arbitrarily refuse to issue a permit. Investors can make side payments to gatekeepers. We show that with competitive gatekeepers, gatekeeping outperforms monitoring and attains first best. Thus in an ideal world, gatekeeping is the optimal mechanism.

The basic intuition for this result is as follows. Under monitoring, the problem of efficient assignment coupled with the need to generate incentive to monitor creates inefficiency. Gatekeepers, on the other hand, face exactly the opposite problem - under optimal payments, a gatekeeping mechanism sets the incentive to deny a permit. Thus the default is to deny access to credit - and it is the informed party (investor) who must get the gatekeeper to grant a permit by making appropriate side payments. Once the gatekeeper’s payoffs from denying a permit is set correctly, it induces separation among investors - only investors with a low cost of effort can afford the side payments

necessary to procure a permit. Thus while monitors need to be given an incentive to seek information (because monitoring is costly), it is the informed who seek gatekeepers, and reveal private information about own cost of effort through side payments. At the same time, competition among gatekeepers limits their surplus extracting ability. These two factors together make competitive gatekeeping more effective than monitoring.

As it allows for side payments, a gatekeeping mechanism takes into account all possible collusive arrangements between gatekeepers and investors at the outset. However, if gatekeepers could collude, the mechanism fails to solve the assignment problem efficiently and dissipates the incentive to invest.

#### RELATING TO THE LITERATURE ON INFORMAL CREDIT ORGANIZATIONS

Stiglitz (1990) and Varian (1990) introduced the idea of monitoring by peers who are likely to have better information about the investors compared to outside lenders. Organizations such as credit cooperatives usually have both borrowing and non-borrowing members, and an important feature of successful cooperatives is that the latter have an incentive to monitor the former. While there is a large literature on such collective credit organizations, there is relatively little work on optimal peer monitoring design in such organizations. An important contribution in this regard is by Banerjee et al. (1994). They model a cooperative with a productive agent who borrows funds and invests, and a non-investing agent who can lend own funds to the cooperative, and potentially monitor project choice by the investing agent. They show that by setting the extent of internal borrowing (borrowing from non-investing agent), the extent of the monitor's liability and the interest rate paid on the internal funds, the cooperative induces the non-investing agent to monitor investment.

However, as Besley(1995a,b) points out, there are two important problems with such mechanisms that are usually ignored in the theoretical analysis. The first problem is the possibility of collusion between a monitor and an investor. Informal organizations such as cooperatives can harness the fact that individuals have much better information about each other compared to outside bodies and generate peer monitoring, but the fact that individuals know each other well also makes collusion likely. Second, when there are many potential monitors, and monitoring is costly, peer monitoring



incentives could be diluted by the possibility of free riding.

The analysis of Banerjee et al. (1994) does not consider possibility of collusion, and with a single non-borrowing member the possibility of free-riding does not arise. Further, the assignment problem does not arise since they exogenously specify a borrowing and a non-borrowing agent. This paper, in contrast, analyzes these problems. The assignment problem is solved endogenously. Further, the paper explicitly considers the possibility of collusion between monitors and investors. With many agents, the potential for free-riding among monitors is present as well.

The issue of incentive design also plays a central role in the related literature on group lending with joint liability<sup>(5)</sup>. In group lending schemes, the focus is on small, relatively homogeneous groups of borrowers who are jointly liable for a loan to any member of the group. Joint liability fosters incentive for each borrower to monitor the others. While similar concerns about collusion and free-riding arise in this setting as well, there are important differences in the structure of incentive constraints. First, since all members of a group are investors, there is no assignment problem. Second, each members serves both as an investor and a monitor. Thus the incentive structure for generating monitoring are somewhat different. Laffont (2000) and Laffont and Rey (2000) adopt a mechanism design approach to consider the problem of collusion in the setting of joint liability. Finally, as Besley and Coate (1995) demonstrate, under joint liability the issue of strategic default becomes important when the outside lender cannot easily observe the outcome of investment. Armendáriz de Aghion (1999) analyzes the optimal design of collective credit agreements with joint liability given the possibility of strategic default. This does not address the issue of collusion. Papers by Besley and Jain (2000), and Rai and Sjöström (2004) study the design of group lending incentives under collusion in the context of strategic default.

## 2 THE MODEL

There is a continuum of agents. Each agent can either earn a safe return or invest in a risky project. Without loss of generality, set the net safe return to 0. Each investment project requires an indivisible investment of 1.

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<sup>(5)</sup>See Ghatak and Guinnane (1999) for a survey.

Agents are assumed to have zero initial wealth.<sup>(6)</sup> The rate of return from production is a random variable that can take two values: 0 and  $R > 1$ . The state with realized rate of return  $R$  is called “success,” and the other state is called “failure.” The probability of success of a project depends on the project’s “type” as well as the effort of the agent. Project “type” denotes the intrinsic success probability (i.e. quality) of a project. This is a random variable  $p$  with a uniform distribution on  $[0, 1]$ . Types are independent across projects.

Throughout the paper, the term “effort” is used to denote the provision of private inputs (e.g. in agriculture - quality and quantity of fertilizer, quantity of water, quantity of workers hired to plant seeds, the quality of the seeds used). An agent could either actively provide private inputs (provide effort), or make little or no effort. With effort, success probability of a project is given by  $p$ , the project’s type. Without effort, on the other hand, success probability is reduced to  $\alpha p$ ,  $0 < \alpha < 1$ .

The cost of effort, however, depends on the state of nature. Under a favorable environment, which occurs with probability  $\theta$ , the cost of effort (cost of private inputs for maintaining a probability of success of  $p$  for type  $p$ ) is  $C_E$ . With probability  $(1 - \theta)$ , the environment is unfavorable, and in that case the cost of effort rises to  $C_E + \Delta$ . Each project draws a cost of effort independently of others.

To summarize, if effort is taken, and the cost of effort is low, the total resource cost is  $1 + C_E$ . If the cost of effort is high, a further  $\Delta$  must be spent to take high effort.

We make the following assumptions:

$$\alpha R < 1.$$

Thus low effort by any type is socially suboptimal. Second,  $\Delta$  is high enough so that

$$R - (C_E + \Delta) < 1.$$

Thus when the cost of high effort is high, investment is socially undesirable.

The type of a project as well as the cost of effort and whether effort is provided are the agent’s private information. Investment is observable, ruling out direct consumption of a loan. Further, the outcome (success or failure) of investment is also observable, and thus repayment contracts are enforceable.

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<sup>(6)</sup>The payoff schemes here can be readily ported to a setting of positive own wealth, and payoff for monitoring can then be interpreted as return on internal borrowing from monitors.

## 2.1 FIRST-BEST INVESTMENT

If cost of effort is high for a project, efficiency requires that it is not operated. Under low cost of effort, investment should proceed so long as the expected net return (with effort provided by the agent) is positive, i.e.  $pR - C_E - 1 \geq 0$ . Therefore the first-best investment cutoff (denoted  $p_{fb}$ ) is given by  $p_{fb}R = 1 + C_E$ , i.e.

$$p_{fb} = \frac{1 + C_E}{R}. \quad (2.1)$$

We assume that  $R > 1 + C_E$ . This implies that the first best cutoff is smaller than 1 - i.e. the first best investment level is positive.

We explain the details of monitoring and gatekeeping mechanisms in sections 4 and 5 respectively.

## 3 INEFFICIENCY WITHOUT MONITORING (OR GATEKEEPING)

A general form of repayment contract is given by  $(T, T_F)$ , where  $T$  is the payment made by the investor in the success state and  $T_F$  is the payment in the failure state. From limited liability,  $T_F \leq 0$ . If  $T_F < 0$  (i.e. if the investor is paid when project fails), the incentive to take high effort is diluted, and at the same time reduces the payoff of the bank. Thus any optimal contract sets  $T_F = 0$ . Therefore, without loss of generality, a repayment contract can be specified simply as a payment  $T$  in the success state.

In the absence of monitoring (or gatekeeping), for there to be a positive measure of agents who invest with high effort when cost of effort is low, it must be that

$$p(R - T) - C_E \geq 0 \quad (3.1)$$

for some  $p < 1$ .

Now suppose investment is efficient - so that a project invests only if cost of effort is low and its type exceeds  $1/R$ . A necessary condition for this to be true is that equation (3.1) holds at  $p = 1/R$ . But at  $p = 1/R$ , the equation becomes  $1 - T/R \geq 0$ , implying that  $R - T \geq 0$ . This in turn implies that  $\alpha p(R - T) > 0$  for all types  $p$ . But this is the participation constraint for projects who do not want to invest with high effort.

Therefore low effort cannot be prevented - if cost of effort is high for a type, it invests with low effort, and if cost of effort is low, it invests even if its type is below  $1/R$ . Thus investment is not efficient. Contradiction. This proves that efficiency is not attainable.

## 4 THE MONITORING MECHANISM

### 4.1 MONITORING AND SECOND BEST INVESTMENT

By spending  $C_M$ , a monitor learns whether a project is facing a high or a low cost of effort (i.e. whether it is efficient for a project to operate), and reports this information to the center. Investment is allowed to proceed only if the monitor reports low cost. We assume that the centre is “strong” in the following sense.

**Assumption 1. (Strong Centre)** *If a monitor reports that a certain project faces high cost of effort, the investor concerned has the option of appealing to the centre which then verifies the cost (incurring a cost greater than  $C_M$ ), and if the monitor’s report turns out to be false, reverses the decision against the investor and fines the monitor all fees received from all the projects assigned to him.*

The fact that it costs the centre more than  $C_M$  to verify the cost of effort merely implies that assigning peer monitors is efficiency improving over direct monitoring by the centre. As shown later, the above assumption helps ensure that monitors have no incentive to block projects by reporting falsely. Of course, submitting a report without actually incurring the monitoring cost is still a potential problem, and taken into account explicitly to ensure incentive to monitor. A second potential problem is that a monitor might collude with the investor and allow a project to proceed by reporting low cost falsely. This is taken into account explicitly in designing a collusion-proof mechanism.

For all projects with high cost of effort, social optimality requires not investing. For all projects with a low cost of effort, the **second-best investment cutoff under monitoring** (denoted  $p_{sb}$ ) is given by  $p_{sb}R - C_E = 1 + C_M$ , i.e.

$$p_{sb} = \frac{1 + C_E + C_M}{R} \quad (4.1)$$

In other words, social optimality requires that all types below  $p_{sb}$  should become monitors, all types above should become potential investors, and invest if cost of effort is low. Note that if the cost of monitoring ( $C_M$ ) is zero, second best coincides with first best.

## 4.2 OPTIMAL MONITORING DESIGN

An optimal monitoring mechanism ideally achieves the following.

1. Implement an efficient assignment of agents to roles of investors and monitors.
2. Induce monitors to undertake (costly) monitoring, and report truthfully to the centre.
3. Satisfy individual rationality and budget balance.
4. Finally, if collusion between monitors and investors is possible, the mechanism must also be collusion-proof.

We first construct a mechanism assuming there is no collusion. The issue of collusion is taken up in section 4.3, which shows that the possibility of collusion does not add any new binding constraint, i.e. the optimal monitoring mechanism we construct below is also collusion-proof.

For each project under a monitor, a payment scheme for the monitor is given by  $\mathbf{Y} = (Y_S, Y_F, Y_{NI})$  where  $Y_S$  and  $Y_F$  are the payments made to the monitor when investment takes place and results in success and failure respectively, and  $Y_{NI}$  is the payment made to the monitor when no investment takes place (i.e. the project is not operated). From limited liability, a monitor cannot be paid a negative amount in any state. Thus  $Y_S \geq 0$ ,  $Y_F \geq 0$ ,  $Y_{NI} \geq 0$ .

Let  $\bar{p}$  denote the average type of the investors. If the type  $p_*$  is the investment cutoff, then  $\bar{p} = (1 + p_*)/2$ . We use the following notation. Given any average type  $x$ ,

$$EY_I(x) \equiv xY_S + (1 - x)Y_F \tag{4.2}$$

Any payment scheme for the monitor must make it worthwhile for the monitor to incur the cost of monitoring. By incurring the cost of monitoring for all projects assigned to

him, the monitor receives an expected payoff of  $\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI} - C_M$  for each project. If for any positive measure of projects the monitor does not incur the cost of monitoring and reports a high cost, a fraction  $\theta$  of such reports would turn out false, the owners of such projects would appeal to the centre, and, from assumption 1, the payoff of the monitor would be zero. Thus assumption 1 implies that a monitor has no incentive to stop investment by reporting a high cost without knowing the true cost. It follows that if a monitor does not incur the cost of monitoring, he allows investment to proceed, and gets a payoff of  $\theta EY_I(\bar{p}) + (1 - \theta) EY_I(\alpha\bar{p})$ .

Therefore the following incentive-to-monitor constraint must be satisfied:

$$\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI} - C_M \geq \theta EY_I(\bar{p}) + (1 - \theta) EY_I(\alpha\bar{p}). \quad (\mathbf{IC}_M)$$

Further, the expression on the left hand side must be positive to ensure participation by the monitor. However, from limited liability,  $Y_S \geq 0$  and  $Y_F \geq 0$ , and thus both  $EY_I(\bar{p})$  and  $EY_I(\alpha\bar{p})$  are positive. Thus the participation constraint of the monitor is satisfied whenever the incentive-to-monitor constraint is satisfied.

Note that once the monitoring cost is incurred, a monitor reports truthfully. Reporting high cost falsely on any positive measure of projects reduces payoff to zero as above, and so long as the investor cannot offer a side payment, nothing can be gained by reporting low cost falsely. If collusion between monitors and investors is possible, the latter is no longer true. This case is taken up later in this section.

A general form of repayment contract is given by  $(T, T_F)$ , where  $T$  ( $T_F$ ) is the payment made by the investor in the success (failure) state. Let  $B \geq 0$  be a fixed base payment to each investor paid irrespective of the state. Since  $B$  is a promised base payoff to all agents, agents cannot be paid less than  $B$  - thus limited liability still implies  $T_F \leq 0$ . As noted in the last section, any optimal contract sets  $T_F = 0$ . Thus, without loss of generality, a repayment contract can be specified simply as a payment  $T$  in the success state. Thus any scheme of transfers (comprising payments to monitors and payments by investors) is a vector  $(\mathbf{Y}, B, T)$ .

The payoff of a monitor is his expected payoff from a project (given by the left hand side of  $(\mathbf{IC}_M)$ ) times the number of projects under him. Since types below  $p_*$  are monitors, and those above  $p_*$  are investors, each monitor is asked to report on  $(1 - p_*)/p_*$

projects.<sup>(7)</sup> The investment cutoff type  $p_*$  is thus given by the following participation constraint for investors which says that the marginal investor (type  $p_*$ ) must earn just as much as a monitor<sup>(8)</sup>:

$$\theta \left( p_*(R - T) - C_E \right) + B = \left( \frac{1 - p_*}{p_*} \right) \left( \theta EY_I(\bar{p}) + (1 - \theta) Y_{NI} - C_M \right). \quad (\mathbf{PC}_I)$$

Finally, budget balance implies that the payment by investors must account for loan repayments as well as payment to monitors. Note that an investor invests only when his cost of effort is low, which happens with probability  $\theta$ . Thus the total net amount collected from investors is  $\int_{p_*}^1 \theta(pT - 1)dp$ . The measure of monitors is  $p_*$ . The total amount paid to monitors is therefore  $p_*(1 - p_*)/p_*(\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI})$  and the total amount paid to investors, whose measure is  $(1 - p_*)$ , is  $(1 - p_*)B$ . Therefore the budget balance equation is given by

$$p_* \left( \frac{1 - p_*}{p_*} \right) (\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI}) + (1 - p_*)B = \theta \int_{p_*}^1 (pT - 1)dp$$

Simplifying, we get

$$\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI} + B = \theta (\bar{p} T - 1). \quad (\mathbf{BB})$$

( $\mathbf{IC}_M$ ), ( $\mathbf{PC}_I$ ), and ( $\mathbf{BB}$ ) characterize the constraints that an optimal mechanism must satisfy.

If either  $Y_S$  or  $Y_F$  is strictly positive, then from (4.2), both  $EY_I(\bar{p})$  and  $EY_I(\alpha\bar{p})$  are strictly positive, and this only makes it harder to satisfy the incentive-to-monitor constraint ( $\mathbf{IC}_M$ ). Thus the optimal payment scheme to monitors involves  $Y_S^* = Y_F^* = 0$  (the superscript denotes optimal values). The following result shows this formally (all proofs are collected in the appendix).

**Lemma 1.** *Under the optimal contract,  $Y_S^* = Y_F^* = 0$ .*

<sup>(7)</sup>If  $(1 - p_*)/p_* < 1$ , then this is the probability with which a monitor is asked to report on a project.

<sup>(8)</sup>In general, the participation constraint for investors requires

$$\theta (p_*(R - T) - C_E) + B \geq \left( \frac{1 - p_*}{p_*} \right) (\theta EY_I(\bar{p}) + (1 - \theta) Y_{NI} - C_M).$$

However, suppose strict inequality holds. Then there exists a type  $\tilde{p} < p_*$  such that  $\theta(\tilde{p}(R - T) - C_E)$  exceeds the right hand side above. Thus such a type would rather invest than monitor. Then  $p_*$  cannot be the investment cutoff. This shows that the participation constraint must hold with equality.

The following result characterizes the optimal mechanism.

**Proposition 1.** *The optimal transfer scheme is given by  $(\mathbf{Y}^*, B^*, T^*)$  where  $B^* = \theta C_E$ ,  $T^* = R$ , and  $\mathbf{Y}^* = (Y_S^*, Y_F^*, Y_{NI}^*)$  is given by  $Y_S^* = Y_F^* = 0$ , and  $Y_{NI}^* = C_M / (1 - \theta)$ . The optimal scheme attains second best and balances the budget whenever  $R \geq R_{min}$ , where*

$$R_{min} = (1 + C_E + C_M) + 2C_M \left( \frac{1 - \theta}{\theta} \right) \quad (4.3)$$

For  $R < R_{min}$ , the transfer scheme attains the second best but incurs a budget deficit of

$$D = C_M(1 - \theta) - \frac{\theta}{2} (R - (1 + C_E + C_M))$$

The result shows that optimal monitoring fails to attain second best. In order to attain second best, a mechanism must implement the second best cutoff  $p_{sb}$  whenever  $p_{sb} < 1$ , i.e. whenever  $R > 1 + C_E + C_M$ . Thus second best requires  $R_{min} = 1 + C_E + C_M$ . However, the result above shows that  $R_{min} > 1 + C_E + C_M$ , and therefore the outcome is inefficient with respect to the second best.

Note that as either  $\theta \rightarrow 1$  (i.e. probability that the cost of effort is high vanishes), the inefficiency vanishes. The reason is that as  $\theta$  grows, it becomes easier to satisfy the incentive to monitor constraint ( $\mathbf{IC}_M$ ). Further, as the cost of monitoring  $C_M \rightarrow 0$ , again the inefficiency vanishes - and also second best coincides with first best. Thus if there is no cost of monitoring, the monitoring mechanism attains first best.

### 4.3 OPTIMAL MONITORING DESIGN UNDER COLLUSION

Collusion here implies that an investor can make side payments to the monitor. This adds a further constraint. Once  $C_M$  is incurred, and the monitor discovers that the effort cost is high, he should report this truthfully - and not be persuaded by any bribe offer by the investor. An investor receives a base payment of  $B$  irrespective of whether he actually invests. Therefore an investor does not have any incentive to offer any part of this as a bribe in order to be allowed to invest. Therefore the maximum bribe that an investor can offer (any such offer is a payment promised in the success state) is  $R - T$ . This translates into an expected payoff of  $\alpha \bar{p}(R - T)$  for the monitor. Not accepting a bribe (and reporting high cost truthfully) leads to the project not being funded and this



earns the monitor a payoff of  $Y_{NI}$ . This explains the following “no-successful-bribe” constraint:

$$Y_{NI} \geq \alpha \bar{p}(R - T) + EY_I(\alpha \bar{p}). \quad (4.4)$$

Now, the optimal contract is given by  $T^* = R$ ,  $Y_S^* = Y_F^* = 0$ . Thus the constraint above reduces to  $Y_{NI} \geq 0$ . But  $Y_{NI}^* = C_M / (1 - \theta) > 0$ . Thus the constraint does not bind, and the scope of monitoring remains exactly the same under collusion - the possibility of collusion does not add any extra binding constraint.

Further, so long as there is a strong centre, monitors gain nothing by colluding. Specifically, if a monitor does not incur the cost of monitoring, assumption 1 ensures that he does not stop any project. Collusion does not help in this regard. Second, once a monitor does incur the monitoring cost, he has no power to demand ant payments to allow a low-cost investor to proceed. As in the other case, collusion between monitors does not help.

The discussion above proves the following result.

**Proposition 2.** *The optimal monitoring mechanism is proof against collusion between a monitor and an investor, as well as collusion among monitors.*

#### 4.4 REMOVING ASSUMPTION 1: ENTRENCHED MONITORS AND GATEKEEPING

Finally, consider the consequences of removing the strong-centre assumption (assumption 1). If it holds, monitors do not stop projects without investing in monitoring. Once the assumption is removed, monitors become entrenched and function effectively as gatekeepers. Specifically, since a monitor can now block a project arbitrarily (without incurring any costs), he can demand a side-payment in order to deliver a favorable report. Thus the report of the monitor is now exactly like a permit granted by a gatekeeper, and the constraints faced by a monitoring mechanism coincide with those facing a gatekeeping mechanism. This proves the following result.

**Proposition 3.** *If assumption 1 does not hold, the monitoring mechanism coincides with the gatekeeping mechanism.*

## 5 A GATEKEEPING MECHANISM

A monitor expends resources to learn the state and report on the realized cost of effort for a project, while a gatekeeper is simply allocated extra property rights as follows. Under gatekeeping, an investor must obtain a permit (granted by a gatekeeper) in order to be able to obtain a loan from the centre and proceed with his project. Once a project applies to a gatekeeper, the gatekeeper (who does not spend any resources to learn the state) chooses a message from the pair {YES,NO}. If a gatekeeper does not grant a permit to a project (i.e. chooses message 'NO'), the investor can apply to another gatekeeper.

For each project under a gatekeeper, consider a payment scheme (for the gatekeeper)  $\mathbf{Y} = (Y_S, Y_F, Y_{NI})$  where  $Y_S$  and  $Y_F$  are the payments made to the gatekeeper when he says 'YES,' and investment results in success and failure respectively, and  $Y_{NI}$  is the payment made to the gatekeeper when he says 'NO' and blocks a project.

By saying 'NO' a gatekeeper can always earn  $Y_{NI}$ . Thus to make him say 'YES,' an investor might need to make a side payment so that the payoff of the gatekeeper by allowing an investment is at least  $Y_{NI}$ . Further, since an investor can apply to other gatekeepers if one gatekeeper says 'NO,' no single gatekeeper can expect to earn more than  $Y_{NI}$  through side payments. Thus setting  $Y_{NI}$  also sets the rent extraction capacity of the gatekeepers.

We now discuss the constraints faced by a gatekeeping mechanism.

If the private cost is high, an investor would want to produce with a low level of private inputs and effort. Such an investor can offer at most  $(R - T)$  as side payment to the gatekeeper. If a gatekeeper says 'YES' to a project that offers at most  $(R - T)$  in the success state, he receives at most  $(\alpha \bar{p} Y_S + (1 - \alpha \bar{p}) Y_F) + \alpha \bar{p}(R - T)$ . By saying 'NO' he receives  $Y_{NI}$ . For the latter to be incentive compatible, the following constraint (no successful side payment by low effort projects) must be satisfied.

$$Y_{NI} \geq (\alpha \bar{p} Y_S + (1 - \alpha \bar{p}) Y_F) + \alpha \bar{p}(R - T). \quad \text{(Block Low Effort)}$$

Further, it must be incentive compatible to say 'YES' when the investor has low cost of effort and intends to invest with high effort. Let  $S$  denote the side payment in this case.

Thus  $S$  must be high enough so that the following no-refusal-for-high-effort constraint is satisfied:

$$Y_{NI} \leq (1 - \theta)Y_{NI} + \theta [(\bar{p} Y_S + (1 - \bar{p}) Y_F) + \bar{p}S].$$

Under competition, the equilibrium side payment just ensures incentive compatibility - implying that the inequality above is satisfied with equality. Solving for  $S$ , and using (4.2),

$$S^* = \frac{Y_{NI} - EY_I(\bar{p})}{\bar{p}}. \quad (\text{Side Payment})$$

**Lemma 2.** *Limited liability is satisfied if  $Y_{NI} \geq 0$ .*

An important implication of the result above is that the signs of  $Y_S$  and  $Y_F$  are unrestricted. Recall that under peer monitoring, limited liability required these to be non-negative in addition to  $Y_{NI} \geq 0$ . The difference is caused by the explicit incorporation of side-payments in the gatekeeping mechanism.

This implies that irrespective of whether investment takes place, the payoff of a gatekeeper is given by  $Y_{NI}^{(9)}$ . To ensure participation by a gatekeeper,  $Y_{NI}$  must be positive.

$$Y_{NI} \geq 0. \quad (\text{PC}_G)$$

Given **(Block Low Effort)**, **(Side Payment)**, and **(PC<sub>G</sub>)**, only low-effort-cost investors apply to a gatekeeper, offer the right side-payment, and gatekeepers say ‘YES’ to all such projects.

The cutoff  $p_*$  is then given by the following indifference condition of the marginal investor. Whenever appropriate, the constraints in this section appear with a superscript “g” (denoting gatekeeping) to differentiate with similar constraints under monitoring design (section 4.2).

$$\theta \left( p_*(R - T - S^*) - C_E \right) = \left( \frac{1 - p_*}{p_*} \right) Y_{NI}, \quad (\text{PC}_I^g)$$

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<sup>(9)</sup>Note that there is no additional constraint on  $S$  requiring it to be non-negative, although it turns out that  $S \geq 0$  in equilibrium. Thus even if transfers from gatekeepers to investors are considered unreasonable, explicitly requiring  $S$  to be non-negative does not change anything.

Given any such cutoff  $p_*$ , all types  $p \geq p_*$  become investors, and obtain a permit by providing the right side-payment from a gatekeepers whenever cost of effort is low (and do not invest otherwise), and all types  $p < p_*$  become gatekeepers.

Finally, the budget balance equation is given by

$$(1 - \theta) Y_{NI} + \theta EY_I(\bar{p}) = \theta (\bar{p} T - 1) \quad (\mathbf{BB}^g)$$

The five constraints above - (**Block Low Effort**), (**Side Payment**), ( $\mathbf{PC}_G$ ), ( $\mathbf{PC}_I^g$ ), and ( $\mathbf{BB}^g$ ) - characterize the optimal gatekeeping mechanism.

The following result now shows that optimal gatekeeping can implement first best.

**Proposition 4.** *The gatekeeping mechanism with the transfer scheme  $(Y^*, T^*, S^*)$  described below balances the budget and attains first best.*

- Each investor pays  $T^*$  in the success state, and zero otherwise, where  $T^*$  is given by

$$T^* = \frac{R}{(1 + C_E)^2 + R^2} \frac{(2R - \alpha((1 + C_E)^2 + R^2))}{(1 - \alpha)}.$$

- Each gatekeeper receives a side payment of  $S^*$  from each project allowed to proceed, where

$$S^* = \frac{\alpha}{(1 - \alpha)} \frac{R \left[ (R - (1 + C_E))^2 + 2C_E R \right]}{((1 + C_E)^2 + R^2)}.$$

- Each gatekeeper receives  $Y_{NI}^*$  whenever investment does not take place, and if investment takes place, then  $Y_S^*$  in the success state, and  $Y_F^*$  otherwise, where

$$\begin{aligned} Y_{NI}^* &= \frac{\theta(1 + C_E)(R - (1 + C_E))}{(1 + C_E)^2 + R^2} \\ Y_S^* = Y_F^* &= Y_{NI}^* - \frac{(R + 1 + C_E)}{2R} S^*. \end{aligned}$$

Recall that the outcome under monitoring could at best attain second best (the second best differs from the first best because there is a cost of monitoring) - and in fact the outcome under optimal monitoring is inefficient with respect to even second best - second best is attained only if  $R > R_{\min}$ , where the latter is given by equation (4.3). Gatekeeping, on the other hand, attains first best whenever  $R > (1 + C_E)$ , i.e. whenever the first best level of investment is positive.

However, as cost of monitoring  $C_M \rightarrow 0$ , second best coincides with first best, and the inefficiency of monitoring goes to zero as well. Thus as the cost of monitoring goes to zero, the advantage of gatekeeping over monitoring vanishes.

## 5.1 COLLUDING GATEKEEPERS

This section explores the consequences of violation of the assumption of competitive gatekeepers. As pointed out by Murphy et al. (1991), one mechanism through which the grabbing hand operates is misallocation of talent. Solving the problem of assignment is at the heart of both gatekeeping and monitoring mechanisms described in earlier sections. We show first how this ability might fail under gatekeeping even though the centre itself is still strong. In a local environment, where gatekeepers know each other quite well, collusion among gatekeepers is possible. This gives rise to the following problem.

**Proposition 5.** *If gatekeepers collude, the gatekeeping mechanism dissipates incentive to invest.*

The intuition is as follows. Once some types choose to invest, the marginal type that invests cannot earn a positive payoff. If the marginal investor earns a strictly positive payoff, the joint profit of gatekeepers can be increased by setting the acceptable level of side-payment offers higher. This in turn implies that some positive measure of investors close to the marginal type would rather be gatekeepers - violating the original assignment. Thus no investment is possible - collusion distorts allocation of talent.

## 6 DISCUSSION

Let us first summarize the results. We show the following.

- The optimal monitoring mechanism solves the problem of assignment of agents to the roles of monitors and investors, and induces the former to carry out costly monitoring which in turn ensures efficient investment. However, the cost of monitoring coupled with the assignment problem implies that the optimal mechanism is inefficient compared to second best. In the limit as the cost of monitoring goes to zero, first

best efficiency is recovered.

- The optimal monitoring mechanism is proof against collusion between monitors as well as collusion between monitors and investors.
- The optimal gatekeeping mechanism solves the assignment problem, and induces efficient investment by allowing side payments from investors to gatekeepers. The mechanism attains first best and outperforms monitoring.
- A gatekeeping mechanism allows side payments, and therefore any further concern about collusion between gatekeepers and investors does not arise.
- The crucial assumption for the monitoring mechanism to work is that the center is strong so that it can penalize monitors. If this “strong centre” assumption does not hold, monitoring reduces to gatekeeping, and therefore monitoring is no longer available as a separate mechanism. The crucial assumption behind gatekeeping is that gatekeepers behave competitively. If gatekeepers can collude, gatekeeping dissipates investment incentives.

The results show that if both “strong centre” and “competitive gatekeepers” assumptions hold, gatekeeping outperforms monitoring. However, as the cost of monitoring goes to zero, the advantage of gatekeeping over monitoring vanishes. Further, if gatekeepers can collude, but the strong center assumption holds, monitoring performs better than gatekeeping. This is because collusion among gatekeepers causes a failure in assignment, and dissipates incentive to invest, but the same is not true under monitoring, which is immune to collusive arrangements. Thus in a collective credit organization with a strong centre, whenever there is a possibility that agents could collude, monitoring is likely to perform better than gatekeeping.

## 7 CONCLUSION

Collective credit organizations face a host of problems in designing incentives to generate efficient investment. These include efficient assignment (i.e. the division of agents between borrowing and non-borrowing members), free riding among monitors, and collusion between investors and monitors. This paper derives monitoring as well as gatekeeping mechanisms designed to address these issues in a collective credit organi-

zation.

We assume that the implementing centre is itself strong in the sense that it can investigate complaints about false reports by monitors, and has the ability to penalize any monitoring agent who submits such a report, thereby removing the incentive to do so. We analyze optimal monitoring under this assumption. The problem of free riding can be preempted by attaching specific monitors to projects. Further, we show that under optimal monitoring, the possibility of collusion between monitors and investors does not add an extra binding constraint. A gatekeeping mechanism, on the other hand, explicitly accounts for side-payments from investors to gatekeepers, and is also collusion-proof by design. However, even though such collusion is not a problem under monitoring, it turns out that solving the assignment problem, coupled with the need to provide incentive to monitor, requires sacrificing efficiency in some cases. Gatekeeping, on the other hand, implements the efficient outcome, and performs better than monitoring.

The basic intuition for this result is that while a monitor needs to be encouraged to seek information by incurring a cost, the default under gatekeeping is to deny credit - and therefore it is the informed party that seeks gatekeepers, and reveals private information about cost of effort through side payments. At the same time, competition among gatekeepers limits their rent seeking ability. The upshot is that gatekeeping solves the assignment problem without loss of efficiency, while also saving on the monitoring cost, and performs better than monitoring.

As monitoring cost goes to zero, the advantage of gatekeeping over monitoring goes to zero. Further, if gatekeepers can themselves collude, gatekeeping dissipates incentive to invest, while under monitoring, monitors do not gain by colluding. If a lot of local information is available, monitoring cost is likely to be low, and local interaction makes collusion among gatekeepers possible. This might explain why non-market credit institutions often rely on monitoring mechanisms. On the other hand, if the implementing centre is itself weak, so that investors have no recourse against rogue monitors who block projects by falsely reporting against them, the constraints arising under monitoring coincide with those under gatekeeping. The plausibility of a weak centre in the context of government regulation therefore explains why the distortion of gatekeeping rather than monitoring serves as the natural focus in addressing issues of corruption.

## APPENDIX: PROOFS

### A.1 PROOF OF LEMMA 1

Let  $\theta EY_I(\bar{p}) + (1 - \theta)EY_I(\alpha\bar{p}) \equiv \phi$ . Using **(BB)** we can rewrite constraints **(IC<sub>M</sub>)** and **(PC<sub>I</sub>)** as

$$\theta(\bar{p}T - 1) - C_M \geq \phi \quad (\mathbf{IC}'_M)$$

$$\theta(p_*(R - T) - C_E) + B = \left(\frac{1 - p_*}{p_*}\right) (\theta(\bar{p}T - 1) - C_M). \quad (\mathbf{PC}'_I)$$

Putting  $p_* = p_{sb}$  and solving for  $T$  from **(PC'<sub>I</sub>)**, we get

$$T^* = \frac{2}{\theta(1 + p_{sb}^2)} \left( B + \theta + C_M(1 - p_{sb}(1 - \theta)) \right) \quad (\mathbf{A.1})$$

Using this, **(IC'<sub>M</sub>)** is satisfied for  $p_{sb} \in [p^L(\phi), p^U(\phi)]$  where

$$p^L(\phi) = \frac{K - \sqrt{K^2 - 4\phi H(\phi)}}{2H(\phi)}$$

and

$$p^U(\phi) = \frac{K + \sqrt{K^2 - 4\phi H(\phi)}}{2H(\phi)}$$

where  $K = B + \theta(1 + C_M)$  and  $H(\phi) = B + \theta + \phi + C_M(2 - \theta)$ . Since  $H'(\phi) > 0$ , it is easy to see that  $\frac{dp^L(\phi)}{d\phi} < 0$  and  $\frac{dp^U(\phi)}{d\phi} > 0$ . Thus reducing  $\phi$  increases the range of parameters for which second best can be achieved. Therefore it is optimal to set  $\phi = 0$ .

Now,  $\phi = \beta Y_S + (1 - \beta)Y_F$ , where  $\beta = (\theta + (1 - \theta)\alpha)\bar{p} < 1$ . Since  $Y_S \geq 0$ , and  $Y_F \geq 0$ ,  $\phi = 0$  implies that  $Y_S^* = Y_F^* = 0$ . ✱

### A.2 PROOF OF PROPOSITION 1

From lemma 1,  $EY_I(\bar{p})^* = 0$ . Using this, the three constraints **(IC<sub>M</sub>)**, **(PC<sub>I</sub>)**, and **(BB)** can be rewritten as

$$(1 - \theta) Y_{NI} - C_M \geq 0 \quad (\mathbf{A.2})$$

$$\theta \left( p_*(R - T) - C_E \right) + B = \left( \frac{1 - p_*}{p_*} \right) \left( (1 - \theta) Y_{NI} - C_M \right) \quad (\mathbf{A.3})$$

$$(1 - \theta) Y_{NI} + B = \theta (\bar{p}T - 1) \quad (\mathbf{A.4})$$



From the proof of this lemma above, we know that second best can be implemented for  $p_{sb} \in [p^L(\phi), p^U(\phi)]$ . Further, at  $\phi = 0$ ,  $p^L(0) = 0$  and

$$p^U(0) = \frac{B + \theta(1 + C_M)}{B + \theta + C_M(2 - \theta)} \quad (\text{A.5})$$

Thus second best can be implemented for  $p_{sb} \leq p^U(0)$ . Now,

$$\frac{\partial p^U(0)}{\partial B} = \frac{2C_M(1 - \theta)}{B + \theta + C_M(2 - \theta)} > 0$$

Thus to maximize the scope of implementing second best,  $B$  should be set to its highest possible value. From (A.4), this implies  $Y_{NI}$  should be set as low as possible, and  $T$  as high as possible. This implies, from (A.2),  $Y_{NI} = \frac{C_M}{(1 - \theta)}$ . Further, the highest possible value of  $T$  is  $R$ . Therefore we have

$$EY_I(\bar{p})^* = 0, \quad Y_{NI}^* = \frac{C_M}{(1 - \theta)}, \quad T^* = R$$

Using these, and using  $p_* = p_{sb}$ , equation (A.3) becomes

$$-\theta C_E + B = 0$$

Thus  $B^* = \theta C_E$ .

Finally, using these values,

$$p^U(0) = \frac{\theta(1 + C_M + C_E)}{\theta(1 + C_M + C_E) + 2C_M(1 - \theta)}$$

Since  $p_{sb} = (1 + C_E + C_M)/R$ , this can be equivalently written as

$$R \geq R_{\min} \equiv (1 + C_E + C_M) + 2C_M \frac{1 - \theta}{\theta}$$

Finally, for  $R < R_{\min}$ , the budget deficit is given by

$$C_M + \theta C_E - \theta \left( \frac{1 + p_{sb}}{2} R - 1 \right)$$

which simplifies to the expression given in the statement of the proposition. ✱

### A.3 PROOF OF PROPOSITION 4

From the budget balance equation (**BB<sup>g</sup>**),

$$Y_{\text{NI}} = \frac{\theta}{(1-\theta)} \left( \bar{p} T - EY_{\text{I}}(\bar{p}) - 1 \right). \quad (\text{A.6})$$

Solving for  $T$  from equation (**PC<sub>I</sub><sup>g</sup>**),

$$T = \frac{EY_{\text{I}}(\bar{p}) - Y_{\text{NI}}}{\bar{p}} + \frac{R \left( \theta Y_{\text{NI}}(1 + C_E) - (R - (1 + C_E)) \right)}{\theta Y_{\text{NI}}(1 + C_E)^2} \quad (\text{A.7})$$

To implement first best, set  $p_* = p_{\text{fb}} = \frac{1 + C_E}{R}$ . Substituting the value of  $T$  from equation (A.7) in equation (A.6),

$$Y_{\text{NI}}^* = \frac{\theta(1 + C_E)(R - (1 + C_E))}{(1 + C_E)^2 + R^2}. \quad (\text{A.8})$$

Using the value of  $T$  and  $Y_{\text{NI}}^*$ , condition (**Block Low Effort**) becomes

$$Y_{\text{F}} \leq Y_{\text{NI}}^* - \frac{(R + 1 + C_E)}{2R} \frac{\alpha}{(1 - \alpha)} \frac{R \left[ (R - (1 + C_E))^2 + 2C_E R \right]}{\left( (1 + C_E)^2 + R^2 \right)}$$

Set  $Y_{\text{F}}$  so that this holds with equality.

How should  $Y_{\text{S}}$  be set? Using the value of  $Y_{\text{F}}$ ,  $Y_{\text{NI}}^*$  and  $T$  from above, the budget balance equation (given by (**BB<sup>g</sup>**)) becomes

$$T + S = \frac{2R^2}{(1 + C_E)^2 + R^2}.$$

where  $S$  is the value of the side payment from (**Side Payment**). Thus  $Y_{\text{S}}$  merely affects the division of the right hand side between  $T^*$  and  $S^*$ . As  $Y_{\text{S}}$  increases,  $EY_{\text{I}}(\bar{p}_{\text{fb}})$  increases, and thus (from equation (A.7)),  $T$  increases (and  $S$  becomes smaller). For simplicity, set  $Y_{\text{S}}^* = Y_{\text{F}}^*$ .

Finally, since  $Y_{\text{S}}^* = Y_{\text{F}}^*$ , it is also true that  $EY_{\text{I}}(\bar{p}_{\text{fb}}) = Y_{\text{S}}^* = Y_{\text{F}}^*$ . Using this in equations (A.7) and (**Side Payment**), the claimed values of  $T^*$  and  $S^*$  are obtained.

This completes the proof. ✱

#### A.4 PROOF OF PROPOSITION 5

If gatekeepers collude, they choose the level of side payment required to produce a ‘YES’ response so as to maximize joint payoff. Suppose there is a strictly positive measure of types who invest - i.e. there is an investment cutoff type  $\theta_* < 1$ . To satisfy the participation constraint, it must be that  $\pi(\theta_*) \geq 0$ .

First, in equilibrium the joint payoff of the gatekeepers is strictly positive. Suppose on the contrary that joint profit is zero. Since payoff of investors is strictly increasing in type, for any  $\theta > \theta_*$ ,  $\pi(\theta) > 0$ . If side payment is raised by a small amount, some investors do not participate any more - but there is still a strictly positive measure of investing agents who pay the new side payment - and therefore the joint payoff of gatekeepers become strictly positive. Thus the joint profit cannot be zero in equilibrium. Therefore each gatekeeper earns a strictly positive payoff in equilibrium (if a gatekeeper earns a zero payoff by participating in collusion, he can express willingness to say ‘YES’ when offered a slightly lower side payment, attract a lot of projects and make a positive payoff).

Second, note that there is no equilibrium with  $\pi(\theta_*) \geq 0$ . If  $\pi(\theta_*) > 0$ , a higher side payment can be charged to all investors without affecting participation decision, raising joint profit. If, on the other hand,  $\pi(\theta_*) = 0$ , there is an  $\epsilon > 0$  such that investors of type  $\theta \in [\theta_*, \theta_* + \epsilon)$  strictly prefer being gatekeepers than investors. Thus there is no equilibrium with  $\pi(\theta_*) \geq 0$  for any  $\theta_* < 1$ . This implies that there is no equilibrium with any positive level of investment. Collusion among gatekeepers dissipates investment incentives completely. ✱

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