How Do Agencies Compete in the Aid Business?

A Signaling Game between Donors and Recipients

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Abstract

How do foreign aid recipients craft managerial styles and strategies to compete for funding in the global economic market? Previous explanations of the distribution of aid do not address this question, and thus this research is an attempt to fill a gap in current aid literature. Do donors search for signals when determining which agencies will receive aid? Do recipients then craft their strategies in certain ways so as to transmit signals that will avoid adverse selection and reduce moral hazard? To answer these questions, I present a signaling game between recipients and donors. I find that in order for signals to be believable, they must be extremely costly, explaining why signals often get crossed and aid continues to flow to unsuccessful recipients. I then submit a research design aimed at testing these findings.

How do bureaucratic institutions affect the performance of foreign aid? For the past 50 years, bilateral and multi-lateral aid agencies have given money to developing nations in order to stimulate growth and improve humanitarian conditions. Over the past 10-15 years, however, scholars and donors alike have begun to question the efficacy of foreign aid in regards to the development it is supposed to encourage. Researchers (Gibson, Ostrom, and Shivakumar 2001; Dollar and Svensson 1998; Tsikata 1998) note that billions of dollars have been invested in struggling economies since World War II, with little evidence that it has made a difference in poverty levels or other indicators of human development. Often, this lack of progress is attributed to political economy variables, which scholars argue make a nation either more or less able to use aid to effectively spur growth (Burnside and Dollar 2000).[1] Another commonly blamed culprit determining the lack of progress of developing nations is a problem in the incentive structure of aid distribution, caused by the principal-agent problem that arises between donor and recipient nations at the macro level (Murshed and Sen 1995; Martens et al 2002; Gibson, Ostrom, and Shivakumar 2001; Svensson 2000; Dollar and Svensson 1998; Carr, McAuliffe, and MacLachlan 1998; Wittman 1995).

Over 800 million people are hungry (Congressional Hunger Center 2002), and aid does not seem to be alleviating the problem as well as intended, yet aid money is still flowing from donors to recipients. Why is this? Why do agencies continue to donate money in the form of aid, while the problems aid is meant to eradicate persist? While previous explanations accomplish much in determining when aid is most efficacious, they are conflicting on the topic of donor motives. This paper is an attempt to explain donor actions in a way different from past attempts, and a hope to contribute to the literature in offering a new explanation. I argue that foreign aid is subject to market failure due to asymmetric information, and that the model appropriate to understanding the situation is not a principal-agent model, but a signaling model instead. In the

[1] Examples of some commonly tested political economy variables are: length of tenure of regime, method of elections, unemployment rate, financial stability, and divided government measures.

following sections, first I review the extant literature on foreign aid, market failure, and asymmetric information. Then, I present my alternative to modeling the aid situation: a signaling game. In solving the game, I am able to isolate attributes of foreign aid distribution that give insight into why we observe aid flowing despite an apparent disappointment in aid efficacy. Lastly, I generate propositions to be tested and set forth a research design.

The Study of Foreign Aid – the Neoclassical and Neoinstitutional Paradigms

The literature on foreign aid distribution spans several decades, and parallels the prevailing logic of aid distribution among donors along the way. In the decades leading up to the 1980s, aid was given in order to finance investment. It was often attached to specific projects, such as building hospitals, schools, or highways. Thus, the original logic of aid distribution followed a neoclassical paradigm: poor countries need more money. If they had more money, they could save more money, and their economies would grow (Burnside and Dollar 1996). Individuals suffer from a collective action problem (Olson 1965) in that individuals have no incentive to give private money to developing nations, either because they feel their contribution will have no effect, or they feel that someone else will contribute and therefore their own contribution is unnecessary. Therefore, more developed nations should create agencies that provide assistance to underdeveloped nations (Gibson, Ostrom, and Shivakumar 2001).

In the early 1990s, however, when studies began to show that aid was having little or no positive effect on growth or poverty reduction (see Tsikata 1998), scholars and aid distributors realized that the neoclassical paradigm was neglecting some important variables, and they began to include political economy variables in their analyses. They argued that adherents to the neoclassical logic were not accounting for transaction costs of aid distribution and implementation, for incentive structures, or for information asymmetries involved in the aid delivery and implementation process. These concepts, addressed by transaction cost economists and neoinstitutional economists (see Williamson and Masten 1999; see also Furubotn and Richter

2000), highlight possible reasons why merely giving a government a specific amount of aid does not necessarily mean the aid will be appropriated to the donor's intended purpose, especially if proper policies do not exist in the recipient nation. Thus, donors began to disburse aid toward more general programs, rather than projects, with the goal of promoting policy reform. Most donors were concluding that the reason aid had not been effective was because it was being given to countries that did not have policy environments that were conducive to growth. Empirical tests substantiate these conclusions (Dollar and Svensson 1998), showing that success or failure of aid projects depends on the political and economic structures of a recipient nation when it receives aid.

Despite this change in attitude toward the purpose of aid, the distribution of aid has not been redirected toward nations that already have good policy environments. Since this change in aid objectives, scholars (Burnside and Dollar 1996, 2000; Dollar and Svensson 1998; Devarajan, Dollar, and Holmgren 1999; Chauvet and Guillaumont 2002; Haggard and Webb 1994) have been arguing that aid should be targeted at recipients that already have solid and appropriate fiscal, monetary, and trade policies, and political stability. Empirical evidence, however, suggests that bilateral aid is not distributed according to these characteristics (Burnside and Dollar 2000). Why is this? What is it that determines how much aid flows between a donor agency and a recipient agency? Tsikata's (1998) review of the literature highlights general trends that we see in aid distribution. Structurally speaking, aid tends to go to countries that are small in population and poor. Recent trends indicate that project aid dominates most assistance packages (75%), while debt relief constitutes roughly 9% of aid, and food and other program aid is decreasing. In 56 countries over a 20-year period, the median ratio of aid to GDP, often taken as a measurement for aid dependence, increased from 6% to 11% (ibid, 5-7).

The fact that between seventy and eighty percent of the aid in the world is bilateral suggests that individual donor nations' strategic motives may factor into the decision of aid

distribution as well (see McKinlay and Little 1977; Rodrik 1995).[2] Scholars have also posited relationships between aid distribution and human rights records (Cingranelli and Pasquarello 1985), and between aid distribution and military power or demilitarization (Murshed and Sen 1995) or arms imports (see Burnside and Dollar 2000), but results are often inconclusive, and causality is difficult to establish. Yet all of these studies target one common idea: donors make decisions regarding aid distribution, and recipients are portrayed as having only a minor part in the distribution process.

Many previous explanations touch upon various pieces of the aid distribution puzzle in valid ways. These studies often, however, leave the reader with a substantial portion of the distribution of aid unexplained. I submit that previous studies neglect an important component of aid distribution: the idea that recipients actually petition donors for aid in many cases. Yet in terms of the United States Agency for International Development (USAID), for one, recipients submit procurement requests and must actively participate in funding acquisition. It is therefore imperative that we investigate recipients as strategists who compete for funding with other recipients in their field, region, or concentration. Donors' interests are important, and because of this, recipients must structure their procurement plans to appeal to donor interests. We thus cannot neglect to consider the role recipients play, not only in characteristics such as political economy variables that affect implementation, but also in terms of strategies and organizational behavior, when attempting to analyze aid distribution. The first step to analyzing aid in this manner lies in characterizing both donors and recipients as strategic actors.

The Study of Bureaucracies and Foreign Aid – the Principal-Agent Paradigm

[2] Bilateral aid, as it depends on the decisions of only one donor nation, is more likely to be distributed based on strategic interests than multilateral aid. The logic of this relationship is that when several donors are involved, it is more difficult for the strategic interests of one nation to factor in as a criterion for distribution.

The principal-agent paradigm, when applied to foreign aid relationships, accomplishes the task of viewing both donors and recipients as strategic actors. Originally, the principal-agent paradigm was developed in an evaluation of the economic firm. In the principal-agent paradigm for the firm, the owner of the firm is considered the principal, and the workers are considered her agents. The principal cannot perform all the work of the firm by herself, so she must employ others to do some of the necessary tasks. In so doing, however, she cannot spend all of her time or energy monitoring her agents. Because of this lack of monitoring ability, she will never truly know if an agent is exerting her optimum effort, or if an agent is shirking in performing her duty. In other words, there is a situation of asymmetric information, in which the agent knows whether or not she is exerting the maximum possible effort, and the principal does not have access to this information. The principal thus attempts to design a contract with the agent that will ensure that the agent works to the highest capability. The interaction between the principal and the agent in trying to form a contract is referred to as a principal agent game, with the principal making the first move by offering a contract to the prospective agent.

The reason this situation of asymmetric information becomes an issue is because it can lead to one of two main problems: moral hazard and adverse selection. Moral hazard results when the agent shirks from her duty because the principal cannot observe her actions. Adverse selection results when candidates who are less desirable for a position get hired because they cannot be distinguished from other candidates. In order to avoid these problems, scholars (and presumably real-life principals) have devoted much effort to deriving optimal contracts that reduce shirking as much as possible (see Miller 1992; Fudenberg and Tirole 1990; Svensson 2000; Tirole 1994).

Foreign aid scholars have highlighted moral hazard and adverse selection as being present in foreign aid donor-recipient relationships, as well as many other relationships along the chain of foreign aid distribution (see Martens et al 2002; also Murshed and Sen 1995). The principal-agent chain of foreign aid distribution involves many principals and many agents, and

each actor may play agent in one relationship, and then turn around and play principal in another. The first link in the chain pits the taxpayers in a donor country as principals against the politicians in that country as agents. The second link transfers the politicians to principal status, with a bilateral or multilateral aid organization as their agent. In the next link, donor agents become principals, and the recipient nation's NGOs, private consulting firms, contractors, and governmental organizations become agents. In a possible fourth link, recipient organizations become principals as sub-contractors become agents (Martens et al 2002).

The complexity of this chain means that the multiplicity of principals and agents creates a broken chain of feedback between decision makers and beneficiaries. In the neoclassical view of public institutions (see Martens et al 2002), governmental institutions are efficient because actors within them must be responsive to their constituents in order to maintain their positions. Thus, in the case of many public agencies, over time taxpayers can assess the efficacy and performance of the public actors whose salaries they are paying, and either punish or reward them accordingly. In the case of foreign aid, however, this type of feedback is impossible. One set of constituents pays for the aid (donor taxpayers), while another set of constituents receives the aid (recipient agencies). These two constituencies are politically and geographically distinct, and thus serve to confound the spread of information along the informational chain (ibid.).

Another implication of the complexity of foreign aid in general is that we can encounter double moral hazard (Murshed and Sen 1995) in the link that pits the donor as principal and the recipient as agent. In this case, the principal (donor agency) does not know the agent's (recipient nation's) level of commitment to a given program, *and* the agent cannot observe the principal's underlying strategy or goals. This occurs mainly in cases of bilateral aid distribution, when the donor may have various motives for donating to a given recipient, but may only reveal the motives that it deems necessary to achieve its goals. In this case, both the principal and the agent are in possession of exclusive information regarding its own action, and neither can fully observe the other's actions.

The principal-agent paradigm highlights an incentive problem that arises on the part of the recipient agent, and this problem is often credited in the research as one of the main reasons for the inefficacy of foreign aid. In the words of Carr, McAuliffe, and MacLachlan (1998), "a well-intentioned but outside intervention solves a problem so effectively that the recipient country never learns, or is never given the opportunity, to deal with the problem from within" (11). Actually, the incentive disruption is possibly even more insidious than these authors suggest, for recipients, knowing that aid is on its way, may have little or no incentive to work toward policy reform. If aid is, indeed, given based on economic and social need, then a recipient nation should not want to improve its situation, for then the aid would stop flowing into it. In order to keep aid flows constant, the recipient thus has an incentive to keep economic and political conditions constant as well. To ensure that a recipient is not using this strategy, a donor must engage in costly monitoring, which is often impossible (Svensson 2000). Thus, aid tends to be allocated based on need, and implemented in a way that does little to reduce that need.

In order to solve this incentive problem, the disbursal of much aid has become conditional upon a recipient adhering to various project or program guidelines. The rationale is that if the money is only disbursed conditional upon compliance, then recipients will comply. While much work has been devoted to studying the effects of conditionality (see Tsikata 1998; Dollar and Svensson 1998; Collier et al 1997), there is little evidence that conditionality is an effective threat, and much evidence to the contrary. Recipients are adversely selected, because aid is distributed conditional upon reform, but donors cannot determine whether or not a recipient is truly committed to that reform beforehand. Thus, a recipient may behave as though it were a reformer at the onset, but then shirk from its reforming duties once the money has been disbursed (Dollar and Svensson 1998).

The effects of moral hazard and adverse selection on the performance of foreign aid are vast. Dollar and Svensson (1998) report that most adjustment projects are fully disbursed, despite indications that conditionality agreements are not being or will not be met. Further, they show

that the World Bank tends to devote more of its resources to failing projects than to succeeding projects, diverting administrative resources away from the projects that actually reap benefits from said resources. All these findings are attributed, within the principal-agent paradigm, to asymmetric information and the inability to successfully monitor agents. One main reason for this inability to monitor is that the outputs these agencies seek, in terms of poverty reduction and structural development, are difficult to quantify. Results often take years to verify, despite the fact that adjustment aid may end before the true effects of the program can be assessed. Because monitoring outcomes and impacts is so difficult, monitoring efforts of recipients is even more complex, and moral hazard often results (Martens et al 2002).

A Shift Away from Principal-Agency

Klein, Crawford, and Alchian (1978) outline solutions to the problem of contracting in general. They posit that each transaction has the potential of suffering from "post-contractual opportunistic behavior," or the reneging on contracts to claim rents. They trace Coase's (1937) framework that suggests solving the problem through either contracting or vertical integration. In the sense of foreign aid, contracting solutions could include forging a relationship between donors and recipients that insure against shirking due to the possibility of future interactions, thus avoiding moral hazard. Solutions of vertical integration could include taking in as much of the aid process as possible under the aegis of one agency; that is, vertical integration would mean *not* contracting out various parts of an aid project. Klein, Crawford, and Alchian find that the lower the amount of rents available, the more likely we are to find a contract to resolve the issue. The higher the amount of rents available, the more likely we are to witness vertical integration.

Yet in the structure of aid distribution, we find a trend of distribution based on contracting, despite evidence that possible post-contractual rents are particularly high. Since contracts still persist, it becomes imperative for contract selection, and donor selection of recipients, to be executed carefully. It is in the interest of the donor agency to select recipients

that will not shirk, so as to avoid moral hazard. It thus becomes in the interest of recipient agencies, competing for funding, to signal to donors that they are the proper recipients to select in order to avoid moral hazard.

Yet in assuming that recipients send a signal, we take the model of foreign aid out of the realm of the principal-agency paradigm, because in the classic principal-agent story, the principal moves first by offering the agent a contract. When submitting procurement proposals, however, the recipient makes the first move. Therefore, it is useful to step out of the principal-agent paradigm when reviewing aid distribution. We must allow the recipient to move first, and in so doing, we create a signaling game instead of a principal-agent game. It is this signaling game that begins to lend explanations to the puzzle of why aid distribution continues despite apparent disappointments in implementation efficacy.

Transferring the Classic Signaling Game to a Foreign Aid Application

Let us first examine the classic signaling game, and then see if we can transfer it to apply to the situation of foreign aid distribution. A classic signaling game captures the idea of asymmetric information between a Sender and a Receiver. Suppose a lobbyist has special information regarding a legislator's constituency's preferences over a certain issue. The issue may be one of two types: either the issue is highly salient to the constituency, or it is of low salience. The lobbyist knows whether or not the constituency regards an issue as being of high or low salience. The legislator does not have access to this information, but knows that the lobbyist does have access to it. In the first strategic move of the game, the lobbyist chooses whether or not to send a signal to the legislator regarding the issue's type; the lobbyist is thus referred to as the *sender*. The legislator or *receiver*, then, must determine whether or not to believe the signal when voting on public policy issues.

A key feature of solving this model lies in determining whether or not the lobbyist's signal can be believed. Is it an accurate signal of constituency preferences, or is it a false signal,

hoping to convince the legislator that an issue is salient when it really is not? If the lobbyist sends *credible* signals, the legislator knows she can always believe the lobbyist. She learns accurate information from the lobbyist regarding constituency preferences, and votes accordingly. A non-credible signal, or *cheap talk*, is something the legislator knows she cannot believe. The legislator learns no true information about the preferences of her constituency, for she cannot believe the lobbyist to be telling the truth in all situations. The crux to solving signaling games lies in finding the situations in which signals are credible, and distinguishing them from situations in which signals are merely cheap talk. Our task lies in not only finding credible signals, but in switching the signaling game to apply to foreign aid.

It is not difficult to make the jump from the classic legislator-lobbyist signaling game to a donor-recipient signaling game with a similar structure. In transferring the model, we are able to depict the real-life example of recipient agencies that file procurement requests for funding. The aid recipient is the classic "sender" and the aid donor is the classic "receiver." The procurement request of the recipient becomes the mode for signaling the recipient's type to the donor, and the funding decision of the donor becomes the receiver's response to the signal. This story leads to the development of many different types of models. We will address a few of them here in our search for an explanation to the puzzle of why ineffective aid persists.

First Model – Costless Signaling

Consider the following situation. An aid recipient can be one of two types: either it is successful at implementing aid, or it is unsuccessful at implementing aid. The recipient has private information regarding its ability to implement aid. The donor does not have access to information regarding the recipient's type, but it knows that the recipient does have access to this information. The recipient may send a signal of its implementation ability, and the donor must choose whether or not to believe that signal when determining how to allocate funding. In formulating the model, we must ask how a recipient agency can and will signal to a donor agency

that it is the type of recipient the donor seeks. Further, what features are required in order to make a signal believable to the donor, rather than just cheap talk? Determining the conditions under which recipient signals are credible gives us new insight into the aid distribution relationship.

The Game

Recall that we are modeling a situation in which a recipient files a procurement request with a donor, in an attempt to obtain funding for a particular project or program. Consider Model 1.1, which models the basic interaction between a Donor Agency (D) and a Recipient Agency (R), assuming that the agencies have not had a funding relationship before this game.[3] First, Nature (N) designates the type of the Recipient; that is, whether the Recipient is a Successful agency (S) or an Unsuccessful agency (~S). In other words, is the Recipient likely to utilize aid effectively and efficiently to the satisfaction of the Donor, or not? The Recipient is aware of Nature's move, but the Donor is not aware of this move, thus creating a situation of asymmetric information. The Donor does have, however, a belief regarding the probability (p) that the Recipient is the Successful type of agency. This probability belief is *common knowledge* in that both the Recipient and the Donor know the probability, and know that their opponent knows the probability, of the Recipient being Successful. Assume that $p < 1$, or that there is at least one Unsuccessful recipient agency in the population of aid recipients.

After Nature assigns a type to the Recipient, the Recipient follows the classic signaling model, and makes the first strategic decision, that of whether or not to send a signal to the Donor. The Recipient may ask the Donor for either High Funding (H) or Low Funding (L). A request for High Funding sends a signal that the Recipient is a Successful agency, but the signal may not always be credible; it may just be cheap talk. A request for Low Funding sends no signal

[3] Initially, we must analyze the game as though the two agencies have no prior record of funding relationships. Later models will address the issue of a funding history, as suggested by Martin Hewitt at USAID (interview with author, 18 December 2003), between donors and recipients.

whatsoever. Then, the Donor has a chance to move, and it can either Fund (F) or Not Fund (~F) the Recipient's request. The game ends and payoffs are awarded based on the outcome.

For each Recipient, payoffs are based on how much money is granted by the Donor. Therefore, it is better to be funded at a high level (payoff: 10) than at a low level (payoff: 6), and the lowest payoff comes from not being funded at all (payoff: 0). For each Donor, payoffs are based on the successfulness of the Recipient. The Donor receives the highest payoff when it funds a successful Recipient, regardless of type (payoff: 10). This payoff is higher than that of granting no funding whatsoever (payoff: 0). The lowest payoff comes from Funding a failing agency, regardless of type (payoff: -10). Notation proceeds as follows:

- J^i – a Recipient of type *i* asks for funding of level *J*
- G^j – a Donor chooses action *G* in response to a request of funding at level *j*
- *p* – the probability that a Recipient is Successful
- 1- *p* – the probability that a Recipient is Unsuccessful
- *q* – the probability that the Donor believes the Recipient is Successful, given a request of High Funding
- 1- *q* – the probability that the Donor believes the Recipient is Unsuccessful, given a request of High Funding

Both players share a belief regarding the probability, *p*, that the Recipient is a Successful agency. Thus, the payoff to each player of playing a given strategy equals the sum of the possible payoffs from each outcome of that strategy, with each outcome's payoff weighted according to the probability of reaching that outcome. This weighted sum is called the *expected* value of playing a given strategy. These strategy payoffs are listed in the matrix at the bottom of Model 1.1.

Each player has four possible strategies. The Recipient may play "$H^SH^{\sim S}$," for example, which can be interpreted as "the Recipient requests High Funding if it is Successful, and requests High Funding if it is Unsuccessful." If the Recipient plays "$H^SL^{\sim S}$," on the other hand, it "requests High Funding if it is Successful, and requests Low Funding if it is Unsuccessful." The strategies "$L^SH^{\sim S}$" and "$L^SL^{\sim S}$" can be interpreted in a similar fashion for the Recipient.

The Donor also has four possible strategies. "$F^{H}F^{L}$" is the strategy wherein the Donor "Funds if the request is High, and Funds if the request is Low." "$F^{H}{\sim}F^{L}$," then, means the Donor "Funds if the request is High, and does Not Fund if the request is Low." "$\sim F^{H}F^{L}$" and "$\sim F^{H}{\sim}F^{L}$" can be interpreted similarly as well.

In order to calculate the payoffs for each cell, we must consider the possible outcomes of the game in which each player plays a given strategy. Take, for instance, the upper left-hand cell of the matrix, where the strategies "$H^{S}H^{\sim S}$" and "$F^{H}F^{L}$" meet. In this case, the players will end up with payoffs (10, 10) if the Recipient is Successful, and will end up with payoffs (10, -10) if the Recipient is Unsuccessful.[4] In other words, they will receive (10, 10) with probability *p*, and (10, -10) with probability 1- *p*. Thus, the payoff for the Recipient in the cell where these two strategies intersect is: (10)(*p*) + (10)(1- *p*), or 10. The payoff for the Donor in the same cell is: (10)(p) + (-10)(1- *p*), or 20*p* – 10. The payoff for the entire cell is then: (10, 20*p* - 10). Similar calculations produce the payoffs in the other cells as well.

Notice that the payoff of the Donor is dependent upon the type of the Recipient. If the Donor can distinguish the recipient's type before moving, it can assure itself a positive payoff. Further, the Recipient's payoff depends upon convincing the Donor that it is of the Successful type, whether it is or not. Also, the Recipient bears no cost for signaling by requesting high funding; sending the signal is free. Thus, the Donor seeks a situation in which a Recipient's signal of being Successful is credible. Under what conditions might we find the Recipient sending a credible signal? Is it possible for a credible signal to exist in Model 1.1?

Solving the Game – The Search for Credible Signals

To answer these questions, I first turn to the exposition given by Watson (2002: 273-277). Consider the belief structure of the Donor. While the Donor cannot observe Nature's designation of a recipient's type, the Donor can observe the action chosen by the Recipient,

[4] In all payoff pairs, the Recipient's payoff is listed first, and the Donor's payoff is listed second.

whether or not the Recipient requests High Funding. At that point, the Donor may update its beliefs based on the Recipient's action. Hence we have the probability q, a conditional probability of the Donor. In this model, q represents the Donor's belief of the probability that the Recipient is Successful *given that the Recipient has requested High Funding*. $(1 - q)$, then is the probability that the Recipient is Unsuccessful given that the Recipient has requested High Funding. Suppose the Donor knows that the Recipient will always request High Funding if it is Unsuccessful, and that the Recipient will always request Low Funding if it is Successful; that is, the Donor knows the Recipient is playing the strategy $L^{S}H^{\sim S}$. In this case, we know that q, the probability of a Recipient being Successful given that it requests High Funding, is equal to zero. Then, suppose that when it is the Recipient's turn to move, it requests Low Funding. Immediately, the Donor will know the type of the Recipient; it is a Successful recipient and should be funded accordingly, at its requested level.

The situation described immediately above leads to what is called a *separating equilibrium*. In a separating equilibrium, types are distinguishable by the actions they take. One possible separating equilibrium would involve the Recipient strategy $L^{S}H^{\sim S}$, wherein only the Successful Recipients request Low Funding, and thus fail to send a signal, while only the Unsuccessful recipients choose to send a signal by requesting High Funding. In this case, as when outlined above, $q = 0$. Knowing the value of q, the Donor can respond accordingly. If the Donor observes the Recipient ask for Low Funding, the Donor will Fund, knowing that the Recipient is Successful. A request for High Funding, on the other hand, will send a signal to the Donor that this is an Unsuccessful recipient, and the Donor will Not Fund the proposal. The separating equilibrium is then: $(L^{S}H^{\sim S}, \sim F^{H}F^{L})$.

The other possible Recipient strategy that leads to a separating equilibrium is $H^{S}L^{\sim S}$, wherein only Successful Recipients will send the signal by requesting High Funding. Meanwhile, only Unsuccessful Recipients will choose not to send the signal, or request Low Funding. In this case $q = 1$, and the Donor will be able to determine the type of the Recipient simply by observing

the action taken, or signal sent, and updating its beliefs. The Donor will thus always Fund a Recipient that requests High Funding, knowing that it is sure to be Successful, and will never Fund a Recipient that requests Low Funding, knowing that it is sure to be Unsuccessful. Let us solve the game in Model 1.1 to determine whether or not it has any separating equilibria that can ensure a credible signal.

To solve the game, we will use the method of analyzing best response strategies. The normal form table at the bottom of the page of Model 1.1 pits each possible strategy of the Recipient against each possible strategy of the Donor. Payoffs in **bold** represent each player's best response strategy to each of its opponent's strategies. A cell in which both payoffs are **bold** represents the coupling of best response strategies, or a *Nash Equilibrium*, a situation from which neither player will be made better off by unilaterally playing another strategy. In solving the game, we will find that the occurrence of Nash Equilibria depends on the Donor's perception of the size of p. Let us address the separating equilibria first:

$L^{S}H^{\sim S}$: Does the Recipient's strategy $L^{S}H^{\sim S}$ lead to a separating equilibrium? Given this strategy, we know that $q = 0$, and the Donor's optimal strategy is to play $\sim F^{H}F^{L}$, or "do Not Fund if the request is High, and Fund if the request is Low." We know this because the payoff to the Donor for playing $\sim F^{H}F^{L}$ is the highest the Donor can receive in the row of the matrix where the Recipient plays $L^{S}H^{\sim S}$. If the Donor is playing this strategy, however, the Recipient will be better off playing the strategy $L^{S}L^{\sim S}$, to ensure funding regardless of type (notice that this strategy's payoff is in bold print in the column wherein the Donor is playing $\sim F^{H}F^{L}$). Thus, the Recipient strategy $L^{S}H^{\sim S}$ cannot lead to a stable separating equilibrium.

$H^{S}L^{\sim S}$: Now, consider our next option, $H^{S}L^{\sim S}$; will it lead us to a stable separating equilibrium? If the Recipient is playing this strategy, we know that $q = 1$. In response to this knowledge, the Donor will play $F^{H}\sim F^{L}$, or "do Fund if the request is High, but do Not Fund if the request is Low." Knowing this, however, the Recipient will no longer want to play $H^{S}L^{\sim S}$, for it will be better off by playing $H^{S}H^{\sim S}$, as all requests for High Funding will be granted. Therefore, this strategy cannot lead to a separating equilibrium, either.

There remain two possibilities of pooling equilibria, or equilibria wherein types are indistinguishable:

$H^{S}H^{\sim S}$: First, consider pooling with the Recipient strategy of $H^{S}H^{\sim S}$, where the Recipient requests High Funding regardless of type. Here $q = p$, because the Donor cannot update his

beliefs in any way as a result of the Recipient's action. The Donor's optimal strategy choice depends on the value of p. In order for the Donor to be better off Funding all high requests than Not Funding any high requests, its payoff for Funding high requests when the Recipient plays $H^{S}H^{\sim S}$ must be higher than that of Not Funding high requests in the same situation. That is, the following inequality must hold:

$$20p - 10 > 0 \qquad (1.1a)$$

Solving the inequality, we find that this relationship will only hold if $p > 1/2$, in which case $H^{S}H^{\sim S}$ leads to two pooling equilibria: $\{(H^{S}H^{\sim S}, F^{H}F^{L})$ and $(H^{S}H^{\sim S}, F^{H}\sim F^{L})\}$, both wherein the Donor Funds all high requests. In the first, the Recipient always asks High and the Donor always Funds all requests. In the second, the Recipient always asks High and the Donor always Funds high requests, but not low. In both cases, the Donor does not learn anything about the true type of the Recipient through play.

If $p < 1/2$, however, the Donor will choose to Not Fund any high requests. If the Donor plays the strategy that does Not Fund any requests, the Recipient has no better strategy option than to play $H^{S}H^{\sim S}$, so there exists another pooling equilibrium at $(H^{S}H^{\sim S}, \sim F^{H}\sim F^{L})$. In this equilibrium the Recipient always asks High and the Donor does Not Fund anything. If $p < 1/2$ and the Donor plays a strategy of Not Funding high requests but opts to Fund low requests, the Recipient is better off requesting Low at all times, so this option does not provide us with an equilibrium.

$L^{S}L^{\sim S}$: There is one more possibility for locating a pooling equilibrium: the Recipient strategy $L^{S}L^{\sim S}$. Again, notice that the Recipient's action imparts no knowledge of its type to the Donor. Just as in the case of the previous pooling strategy, however, the Donor's optimal payoff depends on the value of p. Again, if $p > 1/2$, the Donor is better off Funding all low requests. If the Donor chooses to Fund *only* low requests, then the Recipient's optimal strategy is the pooling strategy $L^{S}L^{\sim S}$, and we have found another pooling equilibrium at $(L^{S}L^{\sim S}, \sim F^{H}F^{L})$. If, however, the Donor chooses to Fund all low requests *and* all high requests, then the Recipient would be better off requesting High Funding, and would thus play a different strategy.

If $p < 1/2$, we find the two pooling equilibrium: $(L^{S}L^{\sim S}, \sim F^{H}\sim F^{L})$. In this case, the Recipient always asks Low and the Donor does Not Fund anything. Again, the Donor learns nothing about the true type of the Recipient through the play of the game, but in this case the Donor does Not Fund any request whatsoever.

Discussion

In this basic model, we see a picture of a world of foreign aid that is distributed indiscriminately. In one case, the Donor believes the population of successful applicants to be greater than 1/2, in which case the Recipient requests High Funding and the Donor funds all high requests. In each of these pooling equilibria, the Donor learns nothing regarding the Recipient's true type during the play of the game. The Donor simply Funds whatever type of request it receives. In the other case, the Donor believes this population of successful applicants to be less

than 1/2, in which case the Donor funds no one. We know from empirical evidence that neither of these outcomes is found in the real world; donors fund some applicants while choosing not to fund others. How, then, can the game be adjusted to reflect this reality? Recall that in this model, the Recipient bears no cost of signaling by requesting high funding. For this reason, we see that the Recipient is almost always better off requesting high funding, regardless of the Donor's strategy choice. Let us examine what occurs when the Recipient actually incurs a cost to signaling, and if that has any bearing on the outcome of the game or equilibrium play.

Second Model – the Addition of Differential Signaling

When submitting a procurement request to USAID, a recipient agency expends a cost that consists of the time, energy, and resources required to fill out the request. All agencies must fill out the same type of request, but some agencies may incur a lower cost than others. Take, for instance, Organization S, which knows it will be Successful at implementing aid. Organization S may have devoted resources to acquiring aid from other agencies in the past, and thus may already have employees and templates ready to draft new requests. Further, Organization S, in listing its qualifications for receiving an aid package, may be able to point to past successes, investment of social capital, or superior organizational or managerial techniques that indicate it is a Successful recipient. When justifying an application for High Funding, Organization S will have no trouble coming up with reasons for this request.

Now, consider Organization U, which knows itself to be Unsuccessful, but is hoping to acquire high funding anyway. In order for Organization U to compete with Organization S in high funding acquisition, it must expend even greater resources in filling out its procurement request than Organization S must expend. Organization U cannot easily point to past successes or social capital investment as examples for why it should receive high levels of funding, so it must search to come up with attributes that make it worthy of high funding. Possibly, Organization U would even have to adopt various managerial structures to mirror Organization S, at a large cost

of money and time. Further, it is likely that Organization U does not have the resources at its disposal (templates or personnel) to fill out a competitive request. Thus, Organization U bears a similar cost to Organization S in requesting high funding, but a greater cost because it is not already a successful aid recipient, and so must work harder to make the same request competitively.

What we have just discussed is called a *differential signaling cost* (see Spence 1973). We interpret the differential signaling cost in this case to indicate that it is more difficult for Unsuccessful recipients to signal than for Successful recipients to signal (see Watson 2002: 283). Let us insert such a differential signaling cost into the utility function of the Recipient and see if it affects the outcome of the game.

The Game

In Model 1.2, the game plays out exactly as it does in Model 1.1, except for the addition of a differential signaling cost. Now, the Recipient must pay to ask for High Funding by sending a signal, and the cost of this payment is subtracted from the payoffs of Model 1.1. Thus, if a Recipient signals and is not funded, it bears a negative payoff, as a result of the cost of the signal. Further, assume that the cost to a Successful Recipient of providing a signal is *less* than the cost to an Unsuccessful Recipient of providing a signal. Set the signaling cost to a Successful Recipient at 5, and the signaling cost to an Unsuccessful Recipient at 11. Does the addition of this new differential signaling cost have any effect on the outcome of the model? More specifically, does it enable us to find a separating equilibrium wherein we can identify the type of the Recipient agency?

Solving the Game – The Search for Credible Signals

To answer the questions posed above, let us again resort to reasoning through each possible type of equilibrium. We again use the best response method: please refer to the matrix at

the bottom of Model 1.2. Just as before, we calculate the payoff in each cell by taking the weighted sum, or expected value, of the payoffs possible from each strategy intersection. Also as before, we see that the intersection of best response strategies, or cells with both payoffs in **bold** print, are Nash Equilibria. In contrast to Model 1.1, however, Model 1.2 shows the existence of a new, separating equilibrium due to the differential cost of signaling that depends on type.

We begin as before with the separating equilibria, which we were unable to find in Model 1.1:

$L^{S}H^{\sim S}$: First, let us examine the separating Recipient strategy $L^{S}H^{\sim S}$, where the Recipient asks for Low Funding if it is Successful, and asks for High Funding if it is Unsuccessful. If the Recipient were playing this strategy, we know that the value of *q* would be zero. What Donor strategy would elicit the highest payoff for the Donor in this situation? As in Model 1.1, the Donor's best response is playing the strategy $\sim F^{H}F^{L}$ against this Recipient strategy, where the Donor "does Not Fund if the request is High, but does Fund if the request is Low." Again as above, however, we know that if the Donor intends to play this strategy, then the Recipient would be best off playing $L^{S}L^{\sim S}$, and requesting Low Funding all the time. Therefore, the Recipient strategy $L^{S}H^{\sim S}$ cannot lead us to a separating equilibrium.

$H^{S}L^{\sim S}$: Now consider the alternative separating strategy of $H^{S}L^{\sim S}$; will it produce an equilibrium? If the Recipient is playing this strategy, we know the value of *q* is one. If that is the case, then the Donor is best off playing $F^{H}\sim F^{L}$, and Funding all high requests while Not Funding all low requests. The Donor has learned the true type of the Recipient through interpreting the Recipient's action, and can respond accordingly. What is the Recipient's optimal course of action, considering this Donor strategy? The Recipient will be best off if it sticks to the separating strategy of $H^{S}L^{\sim S}$, and we have found a separating equilibrium at the strategy pair: ($H^{S}L^{\sim S}$, $F^{H}\sim F^{L}$). The Recipient will always signal its true type by requesting High if and only if it is Successful, and will always request Low if it is Unsuccessful. The Donor, knowing this, will then Fund all high requests, and will Not Fund all low requests. Donors and observers alike learn the Recipient's true type through its action.

Now let us consider the pooling equilibria, which we know we found in Model 1.1. Are the same equilibria existent in Model 1.2, with differential signaling?

$H^{S}H^{\sim S}$: First, we take the pooling Recipient strategy $H^{S}H^{\sim S}$. Again, the Donor's optimal response to this strategy depends on the value of *p*. In this case, however, no matter what the Donor's strategy, the Recipient is better off playing a strategy other than $H^{S}H^{\sim S}$. The addition of differential signaling costs has created a drain on the possible payoff from playing the strategy wherein the Recipient asks for High Funding regardless of type, and the cost of differential signaling has made signaling an unprofitable strategy in any situation.. It is no longer profitable for Unsuccessful recipients to signal by asking for

High Funding, and so it will not. Thus, the strategy $H^{S}H^{\sim S}$ does not lead to an equilibrium outcome.

$L^{S}L^{\sim S}$: How about our second pooling strategy: $L^{S}L^{\sim S}$? When the Recipient plays this strategy, it chooses to never incur the signaling cost, and thus the Donor can learn nothing of the true type of the Recipient. In response to this Recipient strategy, the Donor chooses a strategy based on its perception of p. If $p > 1/2$, we find two pooling equilibria in which the Donor Funds all low requests: $\{(L^{S}L^{\sim S}, F^{H}F^{L})$ and $(L^{S}L^{\sim S}, \sim F^{H}F^{L})\}$. The Recipient always requests Low Funding, and the Donor always Funds low requests. The Donor learns nothing about the Recipient's true type, and all low-requesting recipients are again funded indiscriminately.

If $p < 1/2$, however, the Donor prefers to Not Fund any low requests, and we have no equilibria.

Discussion

In both of the pooling equilibria, the Recipient always signals Low, the Donor always Funds Low, and we learn nothing of the true type of the Recipient during play. In the separating equilibrium, however, we find that the Recipient only pays for the signal, and always pays for the signal, when it is, in fact, a Successful recipient. If it is an Unsuccessful recipient, it chooses not to signal. In response to this truthful signal, the Donor is now able to distinguish whether or not this Recipient is successful or unsuccessful, and the Donor Funds only the request for high funding, while choosing to Not Fund requests for low funding.

Since the only things that changed between Model 1.1 and Model 1.2 were the addition of differential signaling costs and the location of a separating equilibrium, we can conclude that the differential signaling costs enabled us to find a separating equilibrium in Model 1.2. Model 1.1 shows that when there is no cost to signaling, there is no reason for the Recipient to truthfully represent its position to the Donor, and so the Recipient will resort to cheap talk in the hopes of receiving higher funding. Decisions regarding funding, then, depend simply on the Donor's perception of the proportion of Successful recipients in the population. Model 1.2, on the other hand, shows that with properly assessed differential signaling costs, Recipient signals can be credible.

What is it about these signaling costs that enables their insertion into the model to yield a separating equilibrium and credible signals? To answer this question, we must create a model that calculates the utility of the Recipient in more generic terms. Only in this way can we find the key relationship between costs and benefits that is necessary to make signals credible.

Third Model – Differential Signaling in Generic Terms

According to Model 1.2, the incorporation of a differential signaling cost into our analysis yields a separating equilibrium. If this differential signaling cost is present, then, we should find separation in the real world as well. That is, we should see Donors Funding only Successful recipients, and we should see Unsuccessful recipients stepping out of the funding acquisition process. Yet we know that this vision is not an empirical reality, for we often find that Unsuccessful organizations are funded before donors are aware of their type. Their type is then only revealed after funding has been disbursed, when donors can analyze the successfulness of the recipient's implementation strategies. Thus, although the differential signaling cost suggests that a separating equilibrium can exist, it is imposing restrictions on the model that the empirical world does not seem to support. What restrictions are these, and what can they tell us about the world of foreign aid distribution?

What is it about Model 1.2, and its differential signaling costs, that enables us to find a separating equilibrium? In other words, what relationships do the costs and benefits of the Recipient's utility function have to have in order for the Recipient to truthfully signal its type to the Donor? In order to answer this question, we must evaluate the payoffs of the Recipient as variables rather than discrete numerical values. We can use these variables to characterize the costs and benefits to the Recipient in generic terms in order to assess their relationship.

The Game

This game, mirroring the two previous games, will have the same basic structure of play. The payoffs will also remain the same for the Donor, but will change for the Recipient. Instead of using numbers to designate Recipient payoffs, we will use the following variables (see Model 1.3):

- Let a be the benefit to a Recipient of being funded High.
- Let b be the benefit to a Recipient of being funded Low.
- Let k be the cost to a Successful Recipient of sending a signal.
- Let m be the cost to an Unsuccessful Recipient of sending a signal.
- It is given that $a > b > 0$

Solving the Game – The Search for Credible Signals

To analyze this model using the generic payoffs, let us move straight to our best response analysis. Notice that in the matrix at the bottom of Model 1.3 the payoffs to the Donor have been placed in **bold** print according to whether or not they are best responses to a given Recipient strategy. Since the payoffs for the Donor have not changed, the best responses of the Donor have remained the same as well. For the Recipient's best responses, however, we need to investigate the situation further.

From our analysis of Model 1.2, we know that we want to end up in the cell reached by the strategy couple $\{(H^{S}L^{\sim S}, F^{H}\sim F^{L})\}$. Only an equilibrium in this cell will be separating. In order to land in this cell, however, we must be sure that the Recipient payoff (a-k)p is greater than any other possible payoff the Recipient can receive against the Donor strategy ($F^{H}\sim F^{L}$). Thus, we must be able to state that the following inequalities hold:

$$(a-k)p > (a-k)p + (a-m)(1-p) \quad (1.3a)$$

$$(a-k)p > (a-m)(1-p) \quad (1.3b)$$

$$(a-k)p > 0 \quad (1.3c)$$

Begin with inequality 1.3c, representing the relationship we must find between the payoff the Recipient can receive by playing strategy $H^{S}L^{\sim S}$ against the Donor strategy $F^{H}\sim F^{L}$, and the payoff the Recipient can receive by playing strategy $L^{S}L^{\sim S}$ against the Donor strategy $F^{H}\sim F^{L}$. In order for the posited relationship to hold, the expression $(a\text{-}k)p$ must be positive. Since p is a probability, we know it must be positive as well. Thus, the expression $(a\text{-}k)$ must also be positive. We thus have the inequality:

$$(a\text{-}k) > 0 \qquad (1.3d)$$

Which easily transforms into:

$$a > k \qquad (1.3e)$$

Now, address inequality 1.3a, which represents the relationship we must find between the Recipient's payoffs from playing the strategy $H^{S}L^{\sim S}$ versus $H^{S}H^{\sim S}$ against Donor strategy $F^{H}\sim F^{L}$. For this inequality to hold, we must find that $(a\text{-}m)(1\text{-}p)$ is a negative number. Begin with the inequality:

$$(a\text{-}k)p > (a\text{-}k)p + (a\text{-}m)(1\text{-}p) \qquad (1.3a)$$

Subtracting the expression $(a\text{-}k)p$ from both sides, we see that

$$0 > (a\text{-}m)(1\text{-}p)$$

Again, because $(1\text{-}p)$ represents a probability, we know it must be positive. Thus, we know that the expression $(a\text{-}m)$ must be negative:

$$0 > (a\text{-}m)$$

$$m > a \qquad (1.3f)$$

Inequalities 1.3e and 1.3f are both necessary to reach the separating equilibrium we found in Model 1.2. We have discovered the required relationship among *a, m,* and *k*:

$$m > a > k \qquad (1.3g)$$

We have not yet assessed the relationship between *b* and *k*, and it is necessary to know this relationship if we are to arrive at the pooling equilibria we found at ($L^{S}L^{\sim S}$, $F^{H}F^{L}$) and ($L^{S}L^{\sim S}$,

~F^HF^L), provided $p > 1/2$. In order to reach these equilibria, we must analyze the payoff relationship for the Recipient's payoffs against at least one of these Donor strategies.

Begin with the Donor strategy F^HF^L. Against this strategy, the Recipient may receive four possible payoffs, and in order to find the pooling equilibrium at ($L^SL^{\sim S}$, F^HF^L), the Recipient strategy $L^SL^{\sim S}$ must yield a higher payoff than any other strategy the Recipient can play against the Donor in this case. Thus we must find that the following inequalities hold:

$$b > (a-k)p + (a-m)(1-p) \quad (1.3h)$$

$$b > (a-k)p + b(1-p) \quad (1.3i)$$

$$b > bp + (a-m)(1-p) \quad (1.3j)$$

Inequality 1.3i can give us the relationship we desire to find. First, multiply the inequality into an expanded form:

$$b > ap - kp + b - bp$$

Subtracting b from both sides, we see that:

$$0 > ap - kp - bp$$

Dividing both sides by the positive value p, we find that:

$$0 > a - k - b$$

$$b > a - k \quad (1.3k)$$

Now we are poised to set our criteria that are both necessary and sufficient to achieve the equilibrium outcomes we find in Model 1.2. Combining inequalities 1.3g and 1.3k, we find that in order to find the pooling and separating equilibria defined in Model 1.2, we must set:

- $m > a > k$ (1.3g)
- $b > a - k$ (1.3k)

What do these inequalities tell us about credible signals? They show that to avoid cheap talk, signals must be more costly than the outcome of sending no signal whatsoever. In other words, the cost to each Recipient of signaling must be higher than any possible benefit to that

Recipient of not signaling, in order for the signal to be believable. Also, the cost to a failing Recipient of a signal must be higher than the highest benefit possible to that failing Recipient. If $m = k$ or $a > m$, we find the pooling results of Model 1.1, and the signal is worthless to the Donor.

Discussion

Model 1.3 gives us important insight into the aid distribution process. We learned from Model 1.2 that in the presence of differential signaling costs, it is possible for Recipient signals to be credible, and for Donors to be able to believe Recipient signals and fund accordingly. We know from the real world, however, that Unsuccessful recipients do not always drop out of the market for funding acquisition, and that Donors can not always trust Recipient signals. With Model 1.3, we were able to explore why the empirical reality does not necessarily match the predicted outcome of Model 1.2.

By analyzing Recipient payoffs generically, we learned that a very stringent relationship must hold between the signaling cost of requesting High Funding and the possible benefit of not sending the signal. The signaling cost must be *greater than* any possible benefit of not signaling; only in such a situation will the Recipient be seen as sending a credible signal to the Donor. Unfortunately, a situation of such high signaling costs is difficult to find. The real-world costs of requesting High Funding do *not* outweigh the benefits of being funded at a low level, or of not being funded at all. Therefore, we find numerous aid recipient agencies that are able to expend the costs necessary to request high funding, with the knowledge that even if they do not receive funding at all, they do not bear a negative cost for the endeavor.

Meanwhile, the Donor is in quite a pickle. Without such relatively high differential signaling costs as Model 1.2 necessitates, the Donor cannot ensure that its recipients are going to use aid money effectively. Without such an assurance, Model 1.1 predicts that Donors will fund indiscriminately, which is not a process justifiable to the Donor's constituency. Is there another game, then, that better captures the situation the Donor faces? Let us examine a model with a

different choice on the part of the Donor; instead of a Donor choosing between Funding and Not Funding, allow the Donor to choose between Funding and Low Funding, and see what happens.

New Modes – Change Donor Actions

Consider a situation wherein a Donor must make funding decisions on behalf of a constituency, such as is represented in the principal-agent problem discussed earlier between the taxpayers that supply aid and the donating agency that distributes aid. The Donor's constituency demands that the pooling equilibria of Model 1.1 be avoided. The Donor should not fund procurement requests indiscriminately; some requests must be funded, but not all. Yet the empirical world dictates that the separating equilibria of Model 1.2 be almost impossible to find. The signaling cost borne by recipients is simply not high enough to ensure credible signals. How can we change the game in order to more adequately capture the situation donors face?

The Game

What if the game were structured a little bit differently, so that the Donor can choose to fund at various levels, rather than not to fund at all? In Model 2.1, the Donor's actions are no longer "Fund, No Fund." Instead, a Donor may either Fund a Recipient request at the requested level, or Low Fund at a level less than that which was requested by the Recipient. The rest of the game remains the same as the game presented in Model 1.1: first, Nature designates the type of the Recipient; then the Recipient chooses between sending a signal that requests High Funding, or requesting Low Funding with no signal; lastly, the Donor chooses between either Funding the request at the level specified by the Recipient, or Low Funding the request at a level lower than the Recipient submitted.

Since the play of the game is altered, the payoffs are altered a bit as well. The Recipient still has a payoff based on the amount of funding it receives, but now it receives a positive payoff in any case, because the Donor can no longer choose to deny funding altogether. The best result

is to be funded at a requested high level (10). The Recipient is then indifferent between receiving low funding after asking for high funding (5), and receiving the requested level of funding when asking for low funding (5). The worst payoff a Recipient can incur is by being funded at a level lower than a request for low funding (2.5). For the time being, we will only consider these payoffs, with no reference to a signaling cost.

For the Donor, payoffs differ as well. While remaining based on the success of the Recipient, they are now also based on how well the level of funding matched the true ability of the recipient. Therefore, a success from a Recipient that receives the funding it requested is considered a "match" in that it was funded at an appropriate level, and yields a payoff of 10. Funding a successful Recipient at a level lower than it requested yields a payoff of 5. Funding an unsuccessful Recipient yields negative payoffs based on the level of funding. Funding a failure at lower than its requested level results in a payoff of -5, while funding at the requested level yields a payoff of -10.

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By taking away the possibility of zero payoffs previously available to the Recipient and the Donor, have we altered the game in any enlightening way? The payoff matrix for Model 2.1 suggests new pooling equilibria. If $p > 1/2$, there are three pooling equilibria: $\{(H^{S}H^{\sim S}, F^{H}F^{L}), (H^{S}H^{\sim S}, F^{H}LF^{L}), (L^{S}L^{\sim S}, LF^{H}F^{L})\}$. In the first two cases, the Recipient always asks High, and the Donor always Funds high at the requested level. In the third, the Recipient always asks Low, and the Donor always funds low requests at the level requested. If $p < 1/2$, there are two pooling equilibria: $\{(H^{S}H^{\sim S}, LF^{H}F^{L}), (H^{S}H^{\sim S}, LF^{H}LF^{L})\}$. In both of these, the Recipient asks High regardless of type, and the Donor funds high requests at a level lower than requested.

In contrast to Model 1.1, there is a separating equilibrium in Model 2.1. Due to the Recipient's indifference between being fully Funded at a requested low level, versus being Low Funded at a high level, we find a separating equilibrium with no restriction on *p*: $\{(LH^{S}H^{\sim S},$

$LF^{H}F^{L})\}$. In this case, the Recipient asks Low when it is Successful and High when it is Unsuccessful, and the Donor Low Funds all High requests and fully Funds all Low requests. Only the Recipient's indifference between these two outcomes will result in a credible signal, but the level of funding of each recipient will be the same. In other words, even though the Donor can now distinguish types based on the Recipient's first move, all Recipients will still receive the same amount of funding.

Add Differential Signaling Costs

In order to establish a separating equilibrium wherein recipients are funded at varying levels, and according to capability, we must once again insert a differential signaling cost into the payoff to Recipients who ask High (see Model 2.2). In this case, the signaling cost to a successful recipient will be 6, while the cost to a failing recipient will be 8. Again, pooling equilibria depend on the level of p. If $p > 1/2$, there are two pooling equilibria: $\{(L^{S}L^{\sim S}, F^{H}F^{L}), (L^{S}L^{\sim S}, LF^{H}F^{L})\}$. In these cases, the Recipient always asks Low, and the Donor always funds low requests fully, at the requested level. If $p < 1/2$, there is one pooling equilibrium: $\{(L^{S}L^{\sim S}, LF^{H}LF^{L})\}$. The Recipient always asks Low, and the Donor always funds low requests at a level lower than requested. The addition of a signaling cost adds a separating equilibrium to this model, as well. With no restrictions on *p*, we find that $\{(H^{S}L^{\sim S}, F^{H}LF^{L})\}$ is an equilibrium. From this strategy combination, we see the outcome of a Recipient asking High when it is successful and asking Low when it is failing. The Donor, then, Funds all high requests at the requested level, and Low Funds all low requests at a level less than requested.

Analyze with Generic Payoffs

What is it about this signaling cost that enables us to find a separating equilibrium? To determine the answer to this question, refer to Model 2.3, which portrays the story of Model 2.2, but uses generic parameters for the Recipient's payoff. In Model 2.3:

- Let *a* be the benefit of a High request being funded High.
- Let *b* be the benefit of a High request being fund Low or a Low request being funded High.
- Let *c* be the benefit of a Low request being funded Low.
- Let *k* be the signaling cost to Success.
- Let *m* be the signaling cost to Failure.

In order to find the equilibria specified in Model 2.2, we must set:[5]

- $a > b > c > 0$
- $m > k > 0$
- $m > a > k > b > 0$
- $c < a-k < b$
- $a-m < c$

In other words, again we find that the cost to each Recipient of signaling must be higher than any possible benefit to that Recipient of not signaling. Also, the signaling cost to a failing Recipient must be higher than the highest benefit possible to that failing Recipient. If the relationships between *a, b, c, k,* and *m* are not the same as that specified above, we find the same pooling equilibrium result as in Model 2.1.

Analysis

Do these models give us any insight into the aid relationship? To answer this question, we must first ask if the models accurately depict what we already observe, and then ask what propositions they generate that are testable empirically. A few characteristics of these games convey both a description of what we already observe, as well as testable propositions, and these are worth noting.

First, let us examine the question of why, despite apparent disappointments in the implementation of aid to accomplish donors' intended goals, donors continue to give aid money. In Model 1.1, we see that if a donor has to choose simply between funding and not funding, *and*

[5] These restrictions were found in the same manner as the restrictions for Model 1.3. Please see the author for proof.

the donor believes that less than half the agencies out there are successful at aid implementation, the donor will choose to fund no one. This explains why so many organizations and potential donors simply choose not to become donors. If they cannot trust that the odds are in their favor of finding implementers who are capable, they will put their money and charitable contributions into other endeavors. Meanwhile, donors with a higher perception of the value of *p* will choose to fund recipients, playing the odds, but always finding a mixture of successful and unsuccessful recipients.

Model 1.2 shows a scenario that offers a little more protection to the donor, and thus accounts for donors who are willing to risk putting their money into aid packages. In this case, a high signal is believable. A donor can fund only those recipients who request high funding packages, provided the costs of signaling are high enough to warrant credible signals.

Model 1.3 shows us, as stated above, that for a signal to be believable, the signaling cost to a recipient must be higher than the highest benefit possible to that recipient for not signaling. If this is not the case, the signal will not be credible. This is quite a restriction, and in testing the model, we must be careful to measure the signal in such a way as to correctly ascertain and capture the relative cost/benefit relationship.

Models 1.1-1.3 show a donor that faces three main payoff options – get lucky and fund a winner and receive a payoff of 10, lose out and fund a failure with a payoff of -10, or play it safe and fund no one, and get a payoff of 0. Models 2.1-2.3 add a new element, in that the donor has a choice between funding at the requested level and funding below the requested level. It is important to note that in this variation, *if the donor encounters an unsuccessful agency, the donor receives a negative payoff in every possible scenario*. Thus, the donor faces the task of minimizing losses against an unsuccessful agency, while maximizing gains against a successful agency. It becomes even more crucial to properly distinguish successes from the rest of the group, and we gain an understanding of exactly why donors remain in the business of aid. The structure of the game shows us that the donor already knows that it will have a negative payoff if

it encounters an unsuccessful agency, which will happen with a certain probability. Therefore, all donors that are in the game at all already know the risk that their opponent will be an unsuccessful agency. The funding of unsuccessful agencies is unavoidable unless $p = 1$, and otherwise, donors know up front that a certain portion of their opponents will be unsuccessful, but they remain in the game, presumably, because of the enduring potential of encountering a success.

Once the signaling cost is added, in 2.2 and 2.3, it becomes easier for the donor to distinguish between successes and those that are unsuccessful, but there remains the chance that the game will end up in a pooling equilibrium. In fact, in all of these models, the pooling equilibria outnumber the separating equilibria. In the empirical world, this explains the uncertainty donors have regarding which agencies to fund, as well as the apparent conundrum found in the existence of funding at all.

The necessary size of the signaling cost is, as stated above, restrictive. If the signaling cost is high relative to other payoffs, it is easier to reach a separating equilibrium. In all likelihood, however, the signaling cost is not nearly this high in the empirical world; if it were, we would see a greater percentage of matching between successful agencies and comparable levels of funding. Thus, we are able to see why the world of aid has such problems in pairing up donors with recipients; the necessary cost of signaling does not exist. Donors cannot distinguish between successful and unsuccessful recipients because the critical value of the differential cost to signaling is exorbitantly large. Thus, they are forced to simply try to minimize their losses or leave the game altogether. Since donors enter the game with full knowledge of the probabilities and payoff structure, those playing (by being donors) have already accepted that they face the chance of a negative payoff.

In minimizing losses, the Donor gets the highest payoff from funding at a level less than the requested level. Because the donor cannot believe that an adequate percentage of recipients are successful, the donor is thus left to under-fund quite a few requests. We find ourselves in a

self-fulfilling prophecy: donors cannot count on recipients to be successful, so they perpetually under-fund requests. Successful recipients are then funded at less-than-ideal levels, and they are left to try to make a successful project with less means than they require. This makes the chances of success even smaller, and even the successful agencies are set on tracks toward poor implementation as a result of insufficient funding.

From these models and the above discussion, I generate the following propositions:

Proposition 1: As the signaling cost falls, the percentage of funding mismatches will increase. Low signaling costs result in an inability for the donor to distinguish between successful and unsuccessful recipients, and thus a high percentage of mismatches in funding. Only sufficiently high signaling costs will result in a separating equilibrium. Thus, the higher the signaling cost, the more likely we are to find matches between recipients and funding levels.

Proposition 2: The higher the signaling cost, the more likely are donors to search for signals when making funding decisions. Although we have established that signaling costs must be quite high in order for signals to be credible, donors still have an incentive to establish and encourage signaling at higher levels, in the attempt to make signaling credible. Thus, higher signaling costs should lead us to a greater dependence of donors upon signaling as an indicator of recipient success.

Proposition 3: As the signaling cost falls, recipients are more likely to engage in signaling, thus making it more difficult to discern the successful recipients. The cheaper the signals, the easier it is for both types of recipients to send those signals. Therefore, the lower the signaling cost, the more difficult it will be to distinguish between types of recipients.

Testing the Model

In order to test these propositions, the research design must attempt to gauge and measure recipient signaling costs. How do recipient agencies send signals? What strategies have they found beneficial in acquiring funding, and do these strategies reflect decision-making criteria espoused by donor agencies? Scott Gates (1989) argues that "without taking into account bureaucratic incentives, it is difficult to determine why the economic reforms supported by aid donors are not implemented by aid recipient governments" (30), suggesting that organizational incentives and structures are important in understanding implementation. I submit they are also important in understanding distribution. I posit that within aid recipient agencies, there exist various institutional structures, managerial styles, and strategies that send signals to donors, and

that these signals condition decisions regarding aid distribution. In the next section, I propose a research design to test this supposition.

How will I measure a signal? Work on the study of bureaucratic structures (Epstein and O'Halloran 1994, 1996; Halperin 1974; Hammond 1986; Moe 1985; Eisner and Meier 1990) suggests two main variables of bureaucracies that I will examine: the nature of decision-making and the nature of goals. Are recipient's decisions driven by budget (see Wittman 1995), or based on discretion and hands tying (Tirole 1994)? These authors indicate that the structure of an agency, and the procedure under which it operates (McCubbins, Noll, and Weingast 1988), influence the choices, level of decision-making power and discretion, and policy outcomes of a bureaucracy. How are decisions made within these bureaucracies – by consensus, by recommendation, or by individuals? In the case of donor bureaucracies, does recipient feedback get factored in to decisions? Who makes decisions regarding aid flows? How much discretion does an agency have, and how closely is it tied to other possible principals, such as participant members, a legislative assembly, or a head of state? Within the recipient agency, who makes decisions, and on what bases? What is the level of ownership of a given program, and who is considered responsible for a program's success or failure? How are funding strategies evaluated, and who decides which strategies will be employed? The nature of decision-making is important to study, as it is an assessment of which signals are sent to the donor regarding implementation possibilities. Signals donors deem suitable will be those that reduce chances for adverse selection and moral hazard.

The goals of agency individuals, be they based on career advancement, monetary compensation, or personal gratification, may either conflict or coincide with goals of the agency as a whole, and thus may interfere with the agency's intended purpose, depending on the level of discretion the agents have in their work (see Romer and Rosenthal 1979; Epstein and O'Halloran 1994). Factors such as how rewards are allocated, how careers advance, and how performance is gauged all determine the level of risk an agent is willing to undertake, as well as the level of

performance an agent is willing to exert. Furthermore, how an agent weights various goals (Tirole 1994) in terms of priorities can affect the choices s/he makes, and the multidimensionality of goals (Holmstrom and Milgrom 1991) can change behavior as well. How are careers structured, and how do career incentives factor in to decision-making? Who evaluates performance of individuals? How do hiring and promoting take place? Are missions or overarching goals espoused within an agency? How are individuals monitored? The goal structure of recipient agencies can also send an important signal to donors as to how effectively aid will be implemented, and whether or not moral hazard will ensue.

In terms of foreign aid in particular, the nature of organization of the agency itself will provide variance in the types of agencies I examine. By the nature of organization, I mean whether or not the recipient agency is governmental, nongovernmental, or private. Consider the nature of goals first. In recipient bureaucracies, goals depend on what type of organization is receiving the money. In an NGO or a governmental organization, for example, quite often there is an overall goal or mission toward which workers strive, and that may cancel out the ability of that agency to focus on any smaller plan or secondary mission that may interfere with the main mission (Tirole 1994). Perhaps donors suffer from a multiplicity of goals or objectives (Martens et al 2002; Gibson, Ostrom, and Shivakumar 2001) that inhibit their ability to work toward a specific goal. The inability to measure performance of an individual in an agency, similar to the inability to measure the performance of the agency itself, may lead the individual to devote more resources to tasks that can be measured, regardless of whether or not they fit into the given program or project (Holmstrom and Milgrom 1991). In a private firm, on the other hand, profits often structure incentives, yet in many cases profits are paid out at the onset of a given project, and do not depend on the project's completion, which can also affect implementation (Martens et al 2002).

The type of organization influences decision-making as well. Gibson, Ostrom, and Shivakumar (2001) argue that the level at which the responsibility and ownership of a given

program is divided can have vast consequences on implementation. Recipients, they argue, should be participants in the process of distribution and implementation at several junctures. They should give input to what types of programs should be financed, as well as the amount of time and effort that should be devoted to a project at the onset. They should bear responsibility for both successes and failures of given programs, and they should have a voice in the decision of whether to continue a project or not. The nature of decision making, in terms of who makes decisions at various levels and who has ownership of programs, is thus an important variable to test.

Once these variables are investigated, it will be crucial to determine what, if any of them, are espoused in order to send signals to donors regarding implementation efficacy. Further, it is important to investigate which signals are viewed by recipients as being successful in acquiring aid. Lastly, I will need to determine which, if any signals are credible in that they lead to the distribution of aid in a "match" scenario, and which are just cheap talk.

Data and Measurement

Data will be collected from donor and recipient agencies. I hope to gather information from organizations such as USAID, the WB, the EC, and the FF regarding aid applications that have been submitted, and investigate trends in criteria used to fund projects, such as past implementation history, size of recipient agency, or length of agency life. This information, coupled with a few in-depth interviews held with key project evaluators, will supply information regarding signals donors use to reduce adverse selection and thus eliminate moral hazard. Do recipients realize these signals, and try to adjust managerial strategies to heighten performance? To explore this question, I will conduct interviews with and administer surveys to individuals within recipient agencies. From the agent's perspective, what kinds of strategies are useful for getting capital? What does that imply about how they manage their organization?

The interviews with recipient agency workers will be conducted in Brazil. Why Brazil? Brazil is a nation that, while just one picture, can give purchase to the situations of other nations' recipient bureaucracies. The wealth gap, along with other indicators of poverty, humanitarian need, and aid dependence, make the Brazilian case generalizable to other cases that share some or all of Brazil's trends in human development indicators.

The surveys will be conducted over the internet, which should not introduce bias because all agencies will have internet access by virtue of their work. I hope to be able to administer the surveys to various types of recipient employees that work all over the world. Each employee in an agency will have a unique login on the survey database, ensuring the survey is completed only by appropriate respondents, and only once by each person. I will develop questions that speak to the issues I have laid out above. I am hoping to have several individuals in each agency respond to the survey, and that my internet survey method will enable and encourage more respondents than usual mail-in surveys. I will then use qualitative interview analysis and quantitative analysis of surveys and agency records to evaluate answers to my questions.

Conclusion

This project is an attempt to contribute to the literature on aid distribution by offering a new approach to evaluating the issue. By characterizing the aid relationship as a signaling game, I am able to isolate reasons why donors might continue to give aid despite apparent disappointments in aid efficacy, as well as why it is so difficult to determine which recipients will be successful and which will not. The suggested tests will gauge not only how valid the propositions are, but also whether or not they are truly testable in the empirical world.

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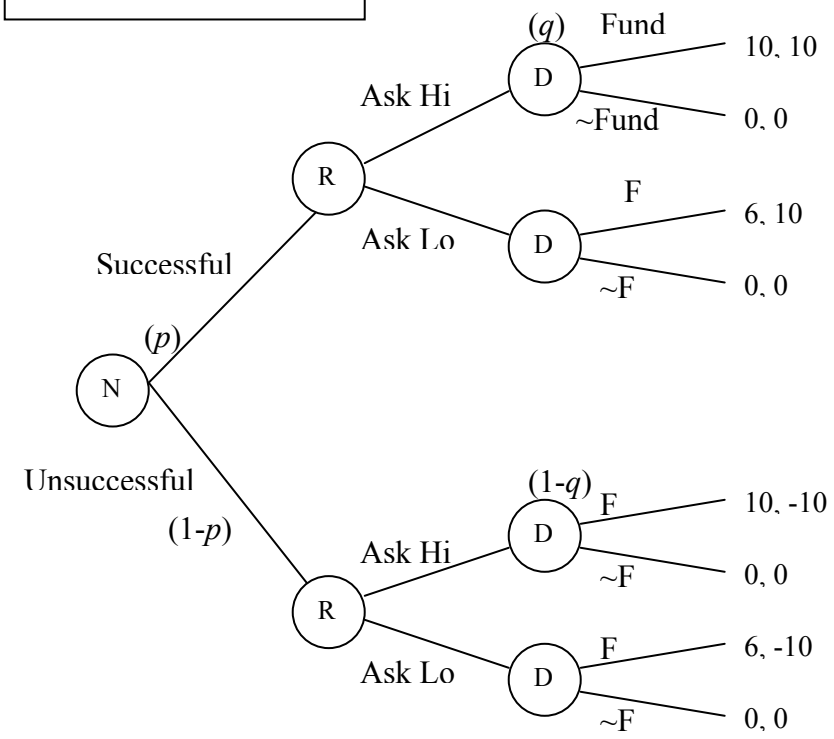
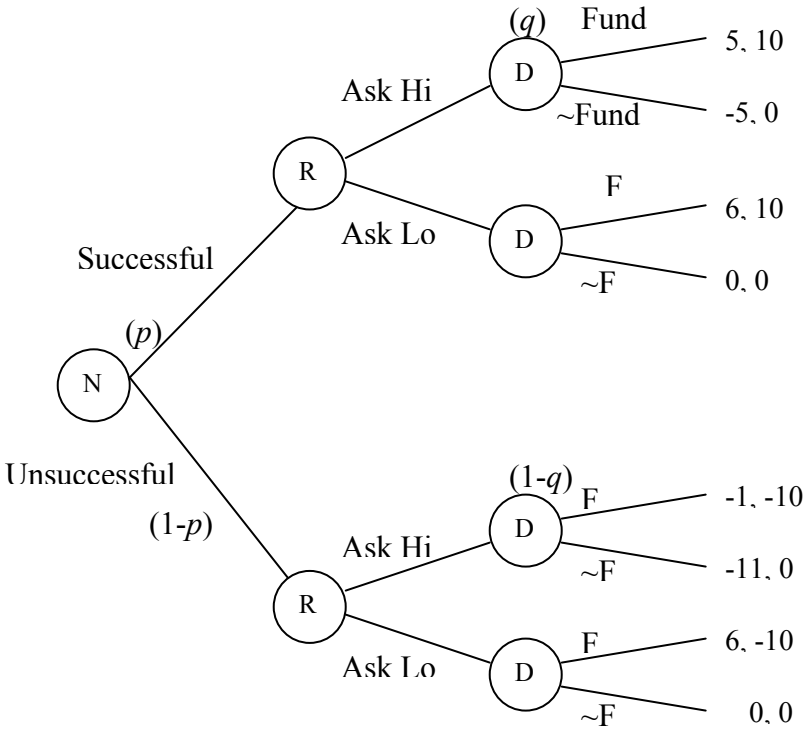
Model 1.1
No signaling cost



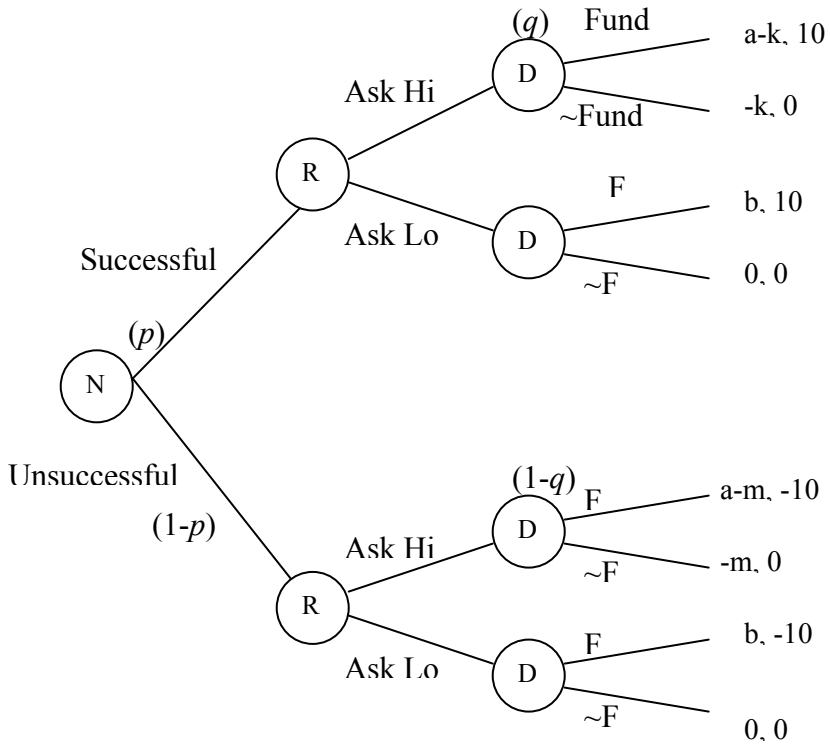
	F^HF^L	$F^H{\sim}F^L$	${\sim}F^HF^L$	${\sim}F^H{\sim}F^L$
$H^SH^{\sim S}$	**10, 20p-10** if p >1/2	**10, 20p-10** if p >1/2	0,**0** if p <1/2	**0,0** if p <1/2
$H^SL^{\sim S}$	4p+6, 20p-10	10p, **10p**	-6p+6, 10p-10	**0,**0
$L^SH^{\sim S}$	-4p+10, 20p-10	-10p+10, 10p-10	6p, **10p**	**0**,0
$L^SL^{\sim S}$	6, **20p-10** if p >1/2	0,**0** if p >1/2	**6, 20p-10** if p >1/2	**0,0** if p <1/2

Model 1.2
Type-Differential
Signaling Cost



	F^HF^L	$F^H{\sim}F^L$	${\sim}F^HF^L$	${\sim}F^H{\sim}F^L$
$H^SH^{\sim S}$	6p-1, **20p-10** if p >1/2	6p-1, **20p-10** if p >1/2	6p-11, **0** if p <1/2	6p-11,**0** if p < 1/2
$H^SL^{\sim S}$	-p+6, 20p-10	**5p**, **10p**	-11p+6, 10p-10	-5p,0
$L^SH^{\sim S}$	5p-1, 20p-10	**-p+1**, 10p-10	16p-11, **10p**	**-11p+11**,0
$L^SL^{\sim S}$	**6**, **20p-10** if p >1/2	0,**0** if p < 1/2	**6**, **20p-10** if p >1/2	0,**0** if p < 1/2

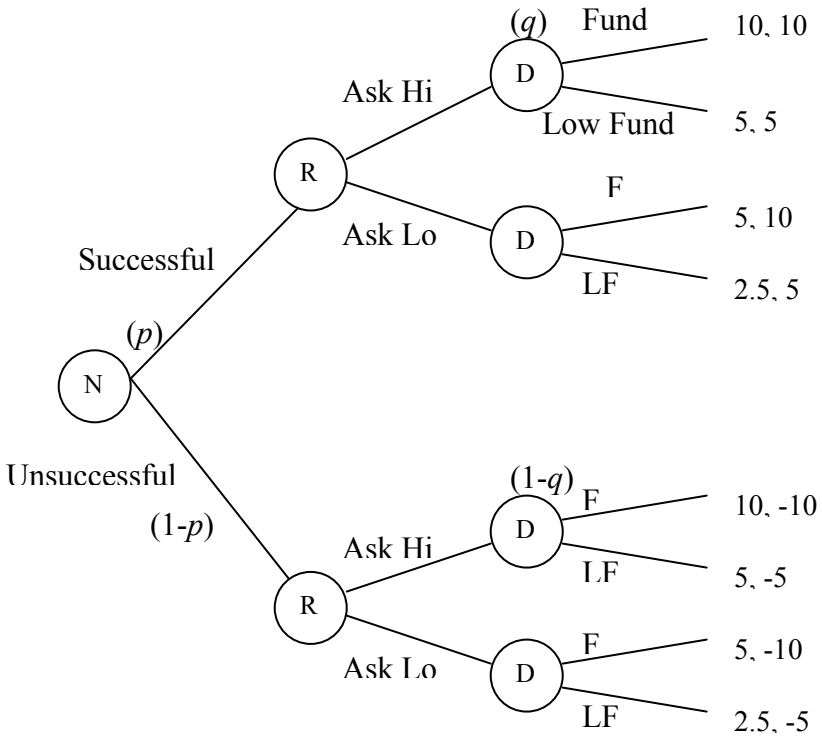
Model 1.3
Recipient-Generic Model
w/Differential Signaling



Let *a* be the benefit of being funded Hi.
Let *b* be the benefit of being funded Lo.
Let *k* be the cost to Success of signal.
Let *m* be the cost to Failure of signal.

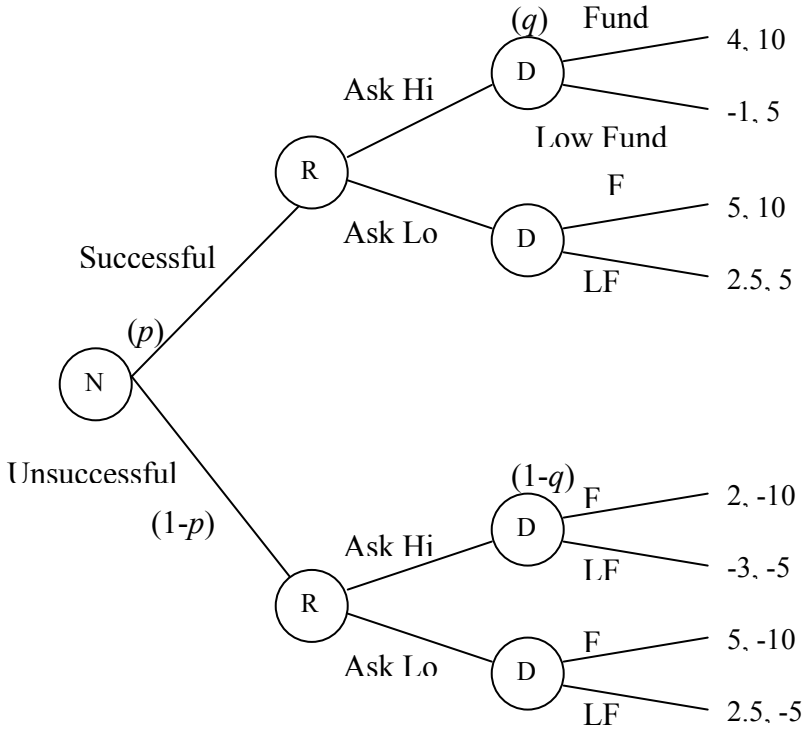
	$F^H F^L$	$F^H \sim F^L$	$\sim F^H F^L$	$\sim F^H \sim F^L$
$H^S H^{\sim S}$	(a-k)p+(a-m)(1-p), **20p-10** if p >1/2	(a-k)p+(a-m)(1-p), **20p-10** if p >1/2	-kp-m(1-p),0	-kp-m(1-p),0
$H^S L^{\sim S}$	(a-k)p+b(1-p), 20p-10	(a-k)p, **10p**	-kp+b(1-p), 10p-10	-kp,0
$L^S H^{\sim S}$	bp+(a-m)(1-p), 20p-10	(a-m)(1-p),**10p**	bp-m(1-p), 10p-10	-m(1-p),0
$L^S L^{\sim S}$	b, **20p-10** if p >1/2	0,**0** if p <1/2	b, **20p-10** if p >1/2	0,**0** if p <1/2

Model 2.1
Fund, Low Fund



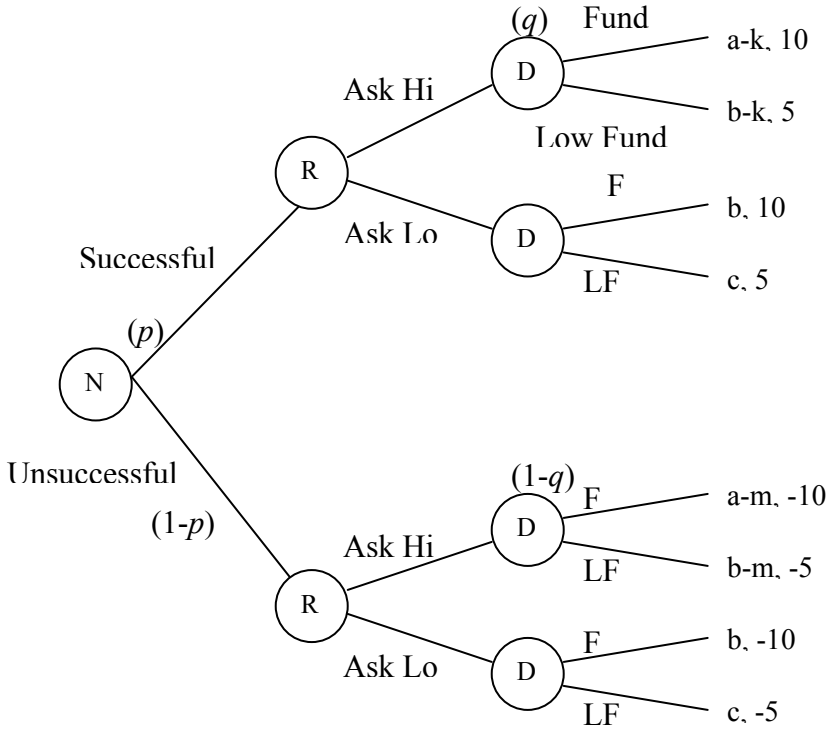
	$F^H F^L$	$F^H LF^L$	$LF^H F^L$	$LF^H LF^L$
$H^S H^{\sim S}$	**10**, **20p-10** if p >1/2	**10**, **20p-10** if p >1/2	**5**,**10p-5** if p <1/2	**5**,**10p-5** if p <1/2
$H^S L^{\sim S}$	5p+5, 20p-10	7.5p+2.5, **15p-5**	**5**, 15p-10	2.5p+2.5, 10p-5
$L^S H^{\sim S}$	-5p+10, 20p-10	-7.5p+10, 15p-10	**5**, **15p-5**	-2.5p+5, 10p-5
$L^S L^{\sim S}$	5, **20p-10** if p >1/2	2.5, **10p-5** if p <1/2	**5**, **20p-10** if p >1/2	2.5, **10p-5** if p <1/2

Model 2.2 F,LF
Type-Differential
Signaling Cost



	$F^H F^L$	$F^H LF^L$	$LF^H F^L$	$LF^H LF^L$
$H^S H^{\sim S}$	2p+2, **20p-10** if p >1/2	2p+2, **20p-10** if p >1/2	2p-3,**10p-5** if p <1/2	2p-3,**10p-5** if p <1/2
$H^S L^{\sim S}$	-p+5, 20p-10	**1.5p+2.5**, **15p-5**	-6p+5, 15p-10	-3.5p+2.5, 10p-5
$L^S H^{\sim S}$	3p+2, 20p-10	.5p+2, 15p-10	8p-3, **15p-5**	5.5p-3, 10p-5
$L^S L^{\sim S}$	**5**, **20p-10** if p >1/2	2.5, **10p-5** if p <1/2	**5**, **20p-10** if p >1/2	**2.5**, **10p-5** if p <1/2

Model 2.3 F, LF Recipient-Generic Model w/Differential Signaling



Let *a* be the benefit of a Hi request being funded Hi.
Let *b* be the benefit of a Hi request being fund Lo or a Lo request being funded Hi.
Let *c* be the benefit of a Lo request being funded Lo.
Let *k* be the cost to Success of signal.
Let *m* be the cost to Failure of signal.

	$F^{H}F^{L}$	$F^{H}LF^{L}$	$LF^{H}F^{L}$	$LF^{H}LF^{L}$
$H^{S}H^{\sim S}$	(a-k)p+(a-m)(1-p), **20p-10** $^{\text{if } p>1/2}$	(a-k)p+(a-m)(1-p), **20p-10** $^{\text{if } p>1/2}$	(b-k)p+(b-m)(1-p), **10p-5** $^{\text{if } p<1/2}$	(b-k)p+(b-m)(1-p), **10p-5** $^{\text{if } p<1/2}$
$H^{S}L^{\sim S}$	(a-k)p+b(1-p), 20p-10	**(a-k)p+c(1-p), 15p-5**	(b-k)p+b(1-p), 15p-10	(b-k)p+c(1-p), 10p-5
$L^{S}H^{\sim S}$	bp+(a-m)(1-p), 20p-10	cp+(a-m)(1-p), 15p-10	bp+(b-m)(1-p), **15p-5**	cp+(b-m)(1-p), 10p-5
$L^{S}L^{\sim S}$	**b**, **20p-10** $^{\text{if } p>1/2}$	c, **10p-5** $^{\text{if } p<1/2}$	**b**, **20p-10** $^{\text{if } p>1/2}$	**c**, **10p-5** $^{\text{if } p<1/2}$