



The Impact of Performance Intensive Policy Intervention: Aid Policy that is Performance Intensive

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Abstract

We examine a two country aid model with performance intensive aid. The aid budget is determined by a donor country legislature, but allocated by a donor agency in terms of a performance criterion of its choice. Five sources of slippage in policy delivery are introduced: the donor agency observes the performance of the aid recipient imperfectly; the donor agency and the aid recipient are subject to inefficiency; the aid recipient experiences corruption; and adjustment of aid recipient performance is costly. Incentives between the aid donor and the aid recipient are intentionally aligned - to explore the best-case for the policy intervention. Immediate implications are then that optimal level of effort and governance in the aid recipient increase under performance intensity of aid. Moreover, performance intensity of aid has fundraising effects. While the aid recipient also has an incentive to increase the measurement noise in governance, this incentive is weaker than that to raise true underlying governance, is weakest for the poorest aid recipients and provided that the donor agency is sufficiently efficient, measurement error itself will serve to raise optimal effort in the aid recipient. The importance of aid agency self-monitoring is thereby identified. Three important qualifications on the anticipated success of the policy emerge, however. Despite the elimination of incentive misalignment, aid donors may come to rely on performance intensity precisely where such a reliance is likely to be least successful in aid recipients. Second, performance intensity of aid maximizes its impact under conditions where it is supplemented by technical assistance to improve the effectiveness of own effort by the aid recipient. Finally, under convex adjustment costs the general class of optimal time paths in governance in aid recipients will be non-monotone, such that governance may get worse before they get better - optimally so. Performance intensive policy may thus appear to fail - immediately after imposition.

Keywords: Aid, performance intensive policy measures, incentives.

JEL classification: D81, D82, D90, E61, O19, O29.

1. Introduction

Calls for performance driven public management have increased. Recent applications of the principle have emerged with respect to foreign aid tied to improved governance in aid recipient countries, state or federal funding tied to test score performance of schools, proxies for quality of health care or short run health indicators, and bonuses and incentive schemes in the public service provision of federal agencies.¹

The suggestion sounds like sound economics. Tie rewards to the desired outcomes of the policy intervention - align the incentives of the agents engaged in policy delivery with intended outcomes. But which performance measures should one use? Are the desired incentive effects likely to emerge? What happens if desirable performance is difficult to observe? Does lurking corruption threaten to derail the sound functioning of the incentive mechanism - and if so how severe is this effect? Can the donor agencies that dispense funds themselves come to distort the intended impact of performance intensity in policy intervention?

In this paper we consider these questions with reference to a relevant abstraction of the problem. The example we detail is the allocation of foreign aid, but the reach of the analysis is more general, including education policy, health policy, the provision of federal services.

In February 2003, President Bush sent Congress a bill to increase foreign aid by 50 percent over the next three years by creating a Millennium Challenge Account (MCA). The MCA provides an additional \$5 billion per year to a select group of poor countries, allocated on the basis of sound policies and honest governments.

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¹The Volcker Commission calls for performance-driven public management. Klitgaard, Fedderke and Akramov (2004) examines in greater detail issues that arise from the choice of performance criteria. Fedderke, Klitgaard and Akramov (2004) supplements with statistical evidence.

To qualify for MCA funds, countries are rated on 16 indicators from a variety of sources.² The requirement is that a poor country score above the median on the anti-corruption indicator and above the median in half of the indicators in each of the three policy areas.

In both scale and design, the MCA has been called the first major foreign aid initiative in more than 40 years (Radelet 2003a, 2003b). Its underlying logic is based on a growing recognition that aid can help countries with good governance, but will make little difference in countries with bad governance. This is a lesson of an influential book by David Dollar and Lance Pritchett (1998) and an article by Burnside and Dollar (2000). Although more recent statistical studies question the robustness of their findings,³ it is now commonly observed that good governance is important for development. And regardless of which way the empirical evidence comes to settle, certainly USAID has linked aid to performance in governance - see USAID (2002:33 and 51).

An abstract version of the problem examined by the paper posits three stages. A legislature (funder, Congress say) specifies an aid budget. This provides money to a donor agency (the executive),⁴ which decides on the allocation criteria according to measures of performance among recipients. Finally, the donor agency then allocates money across a variety of recipients (activities, agents, countries).

The paper explicitly considers the best-case scenario for performance intensive aid. Incentives between the aid donor and the aid recipient are aligned - in the sense that both the aid donor and recipient are concerned with the maximization of aid recipient income.⁵ Further, to exclude aid misallocation on the basis of the strategic pursuit of aid recipients' interests, the aid recipient is deemed to be incapable of influencing the decisions of the aid donor.⁶ Implementation of performance intensive aid in the paper is not without its constraints, however. Five sources of slippage in policy delivery are introduced: the donor agency observes the performance of the aid recipient imperfectly; the donor agency and the aid recipient are subject to inefficiency; the aid recipient experiences corruption; and adjustment of aid recipient performance is costly.

Given the specification of the problem, it is unsurprising to find that aid recipients have an incentive to improve governance and growth-enhancing effort, and that the aid donor has an incentive to increase aid funding.

Equally unsurprising is that the aid recipient has an incentive to also increase the measurement noise in

²The following 16 indicators (with sources), were "chosen because of the relative quality and objectivity of their data, country coverage, public availability, and correlation with growth and poverty reduction, will be used to assess national performance relative to governing justly, investing in people, and encouraging economic freedom":

1. Governing Justly: Civil Liberties (Freedom House); Political Rights (Freedom House); Voice and Accountability (World Bank Institute); Government Effectiveness (World Bank Institute); Rule of Law (World Bank Institute); Control of Corruption (World Bank Institute).
2. Investing in People: Public Primary Education Spending as Percent of GDP (World Bank/national sources); Primary Education Completion Rate (World Bank/national sources); Public Expenditures on Health as Percent of GDP (World Bank/national sources); Immunization Rates: DPT and Measles (World Bank/UN/national sources).
3. Promoting Economic Freedom: Country Credit Rating (Institutional Investor Magazine); Inflation (IMF); 3-Year Budget Deficit (IMF/national sources); Trade Policy (Heritage Foundation); Regulatory Quality (World Bank Institute); Days to Start a Business (World Bank).

By early 2004 the Bush administration had identified 63 countries eligible to compete for the first round of MCA funding because their per capita income was below \$1,415 and they were not deemed to be sponsors of terrorism.

³See for example Easterly et al (2004), and Hansen and Tarp (2000). Collier and Dollar (2002) provide further evidence in support of the importance of governance, and see also the reply by Burnside and Dollar (2004). McGillivray (2004) lists 6 studies that find that aid is more effective under good governance, 26 studies that find aid effective irrespective of governance. Gunning (2004) provides an overview of the debate.

⁴In what follows we treat the executive and the donor agency as interchangeable, though in general we employ the term donor agency. This reflects our assumption that the donor agency is led by an executive authority that represents the decision-making structure of the agency.

⁵Of course this is an abstraction - since it precludes the pursuit of geopolitical self-interest on the part of the donor. We are concerned with the extent to which performance intensity of aid succeeds in achieving its stated objectives under the most propitious conditions.

⁶This also has the advantage of realism. While there may be some recipients that have the capacity to affect the donor agency (Russia?, Brazil?), in the general case this is unlikely (Rwanda).

governance. On the other hand, what is notable is that the incentive to increase measurement noise is weaker than the incentive to raise true underlying governance, and that the incentive to raise measurement noise is likely to be weakest for the poorest aid recipients. Finally, provided that the donor agency is sufficiently efficient, measurement error itself will serve to raise optimal effort in the aid recipient.

A second useful insight of the paper is that despite circumstances that have eliminated any misalignment of incentives between donors and aid recipients, aid donors may come to rely on performance intensity precisely where such a reliance is likely to be least successful.

Third, performance intensity of aid maximizes its impact under conditions where it is supplemented by technical assistance to improve the effectiveness of own effort by the aid recipient.

Finally, under convex adjustment costs the general class of optimal time paths in governance in aid recipients will be non-monotone, such that governance may get worse before they get better - optimally so. Performance intensive policy may thus appear to fail - immediately after imposition.

Section 2. presents a fuller account of the problem of the paper. In section 3. we briefly derive the incentive and fundraising effects of the policy intervention. Measurement error in governance is dealt with in section 4. The reliance of donors on performance intensity where it is least likely to succeed is addressed in section 5. Sections 6. and 7. deal with the impact of aid recipient own productivity and adjustment costs in governance respectively, while section 8. concludes.

2. A Fuller Description of the Problem

Focus of the analysis which follows is on the impact of making a policy intervention conditional on performance in some dimension specified by the legislature. In the case of foreign aid, providing aid conditional on good governance.⁷

Consider a two-country case with donor country and recipient country. The aid granting country has two agencies responsible for the provision of resources for aid (say Congress), and the allocation of aid respectively (say the State Department, or USAID). In what follows, we term these two agencies the legislature or Congress and the executive or donor agency respectively. The two agencies have split power in order to prevent the pursuit of geo-politic self-interest on the part of the donor country.⁸ Eliminating the pursuit of geo-politic interest in granting aid, assumes at the outset that the donor country really does pursue what is most often cited as the purpose of granting foreign aid - maximizing the welfare (measured by income, denoted Y) of the aid recipient, subject to the cost of aid.⁹ We denote aid by k , the cost to the legislature by $C_L(k)$, and for the sake of simplicity assume further that the cost of aid is simply the magnitude of the aid granted.¹⁰ The aid budget is set by the legislature, for allocation by the donor agency. For instance, USAID aid is part of the State Department's budget, submitted by the President and approved by Congress.

The benevolent intention of the donor ensures that the incentives of the legislature and donor agency are aligned with those of the aid recipient - making for the most propitious possible circumstances for the policy intervention. Given that the policy intervention is such that aid is intended to be granted only where the agent is indeed focussed on development (as indicated by good governance), this captures at least the

⁷We have found little guidance in the prior literature on this problem. Adam and O'Connell (1999) considers the impact of aid on an economy in which there is a game between government and private sector. Aid can have a positive impact by lifting the tax burden on the private sector - on condition that the government is sufficiently representative (termed a "developmental state" by Adam and O'Connell). Our concern is more directly with the nature of the relation between aid donor and aid recipient - recognizing the existence of both executive and legislature in the donor country. Azam and Laffont (2003) is an alternative that provides an analysis of aid in terms of contract theory.

⁸Separation of powers is such as to preclude strategic interaction. The legislature delegates authority to the donor agency by means of a charter for the donor agency that determines its authority and precludes the legislature from meddling. The charter is a pre-commitment that is publicly observable, and not subject to re-negotiation. Given the low priority accorded to foreign aid by the electorate of most developed countries, the bargaining power of the donor agency against the legislature on foreign aid allocation would be circumscribed even if present.

⁹In doing so we suppress the possibility that aid may be an instrument by means of which strategic interest dictated by *realpolitische* interests are pursued. Such motivation for aid is undoubtedly present in the consideration of aid donors - but it is not the concern of our analysis.

¹⁰Thus any fixed and variable cost of administration and transfer of aid is effectively borne out of the aid budget itself.

intention of the intervention. Aid is not granted unconditionally, however, but subject to a performance criterion. The legislature determines the rule or criterion on which performance is to be measured (here governance); the donor agency sets the intensity (denoted β) with which performance is rewarded.

The donor agency accepts its mandate as improving aid recipient country welfare without quibble, such that donor agency utility will load purely on recipient country income Y , subject to the operational cost of the donor agency, denoted C_D . We assume operational cost convex in the administrative burden of implementing performance intensity of aid. The donor agency also accepts unconditionally the injunction of the legislature that aid should be conditional on the performance measure given by governance.¹¹

Note that the implication is that the aid budget, k , becomes a function of the governance criterion chosen: $k = k(g)$. This is so for three reasons. Most straightforward is that where aid is tied to the governance performance criterion, $k = k(g)$, in the absence of time inconsistency in the commitment of the aid granting country, the aid budget will have to respond to improved governance on the part of the recipient. We term this the *commitment effect*. The legislature may also value the performance measure chosen for its own sake. For instance, the legislature may value good governance (democracy) in aid recipients for its own sake, as a "moral good" worthy of support. Since the suggestion is that good governance in aid recipients enters the utility function of the legislature as an explicit argument, we term this the *own utility effect*. Finally a likely reason for legislative interest in a governance performance measure is that aid recipients under sound governance are more likely to employ the aid funds effectively. Under sound governance, the aid recipient is subject to separation of powers, transparent and accountable systems of government that render wastage of funds less probable. The result is that every dollar of development aid will have a higher impact if we condition it on good governance. Since this serves the ultimate goal of the aid, governance may also be valued for what we term the *developmental effect*.

Recipient country income depends on capital stock (denoted K), and its effort in pursuing growth-friendly policies, (denoted e). Effort is not costless. The recipient country faces the cost function $C_R = C_R(e)$, presumed convex, $C_{R,e} > 0, C_{R,ee} > 0$. Aid introduces the possibility of raising recipient country income beyond that feasible given capital stock and own effort. We treat aid as a direct transfer payment to the aid recipient, rather than as an addition to recipient country capital stock, such that aid is additively separable from the capital-effort production function of the aid recipient.¹² The motivation here is purity of analytical purpose, as well as realism given the increasing tendency to provide aid in the form of financial rather than physical capital, disbursed at the discretion of the recipient, though not without conditionality.¹³

Motivation for the adoption of the performance criterion in aid is to maximize the impact of aid on recipient country income. The objective is not only to increase recipient country income by the direct transfer (the impact of k on Y), but to improve the intensity of the effort of the recipient country in pursuing growth friendly policy (increasing e , in order to raise Y). To the aid donor effort is not directly observable. For this reason, the aid donor country chooses a measure, in this instance governance (denoted g), that it believes to be functionally related to the underlying effort that it really wishes to stimulate.¹⁴ Justification for the adoption of such an indirect measure rests on the presumption that the observation of a change in the indirect measure, governance, must perforce be a reflection of a change in the underlying

¹¹A modelling question concerns why the model below separates the legislature from the executive, rather than conflating them into the donor. One reason is that it allows for clearer separation of the commitment effect, from the own utility and developmental effects. Under circumstances where the latter two are not relevant, the analysis below stands, but the donor country can be treated simply as the donor agency.

¹²To avoid confusion: note that k and K are therefore not related, except insofar as they both add to recipient country output.

¹³The discussion in Easterly (2001:ch6) provides context, including warnings against expectations of panacea from the new aid structure. Where aid comes in the form of additions to physical capital stock, too often the conditionality of the grant serves to render the aid largely ineffective. Inappropriate and unsustainable giant steel mills, expensive and largely unread research reports by donor country development experts provide examples. See also the discussion in Stein (1992).

¹⁴The presentation of the MCA by USAID quoted in the introduction of this paper makes explicit that the objective of the conditioning aid on governance is not the good governance for its own sake. It is that it is an indicator of sound underlying growth-enhancing policy. We employ "performance" intensity, even though governance is not the intended performance target, effort. A more accurate terminology would be "proxy performance intensity," which we do not employ. One reason is parsimony of terminology - another that our concern is with the analysis of performance measures that are indirect, but are nevertheless tied to the final performance target (however imperfectly).

effort dimension.¹⁵ Specifically, $g = g(e)$, and both $dg = g_e de$, and $dg \geq 0$ if $de \geq 0$ strictly.¹⁶

Implementation of policy is seldom without flaw, often for systematic reasons. We introduce imperfection in policy implementation, termed policy slippage, through four distinct mechanisms.

The first we have already encountered. Aid donors face information asymmetries. Effort of aid recipients cannot be observed directly. Instead, we have a proxy indicator, governance, g , which is an imperfect measure of effort subject to the error ε .¹⁷ Performance intensity of aid is tied to the observable dimension rather than the unobservable underlying effort. This creates an incentive for aid recipients to generate positive measurement error, such that observed governance changes may now be due to $dg = g_e de + d\varepsilon$, rather than just changes in underlying effort. Generation of measurement error by the aid recipient is not costless, however, with $C_R(e, \varepsilon)$ convex in ε , $C_{R,\varepsilon} > 0$, $C_{R,\varepsilon\varepsilon} > 0$.

Second, aid recipients face a separate information asymmetry. The performance intensity of aid is itself subject to some degree of uncertainty. This arises since bureaucratic inefficiency may generate both over- and under-adjustment of aid in response to governance changes. The focus here is on policy slippage that is randomly distributed (since systematic inefficiency could be rationally learnt or anticipated). Thus the aid recipient observes β denotes the true underlying performance intensity of aid, subject to stochastic disturbance, $\mu \sim iid(0, \sigma_\mu^2)$.

Third, the provision of aid resources may be diverted from the final income of the recipient country through corruption, with only some proportion, $0 \leq \phi \leq 1$, of the aid, k , granted reaching the final income of the recipient country, with the rest being diverted into the coffers of corrupt officials in the distribution channels of the aid process.¹⁸ Improvements in governance, since they may lead to increases in accountability and transparency, may lower the opportunity for corruption. We assume lowered corruption returns to improved governance to be subject to diminishing returns, such that $\phi(g)$, $\phi_g > 0$, $\phi_{gg} < 0$.

Fourth, we have already noted that the income of the aid recipient depends on the effort it puts into the pursuit of growth friendly policy. The problem is that sound effort/policy does not always prove effective in stimulating growth. Effort has to be productively deployed also. Poor productivity of effort may be due to the absence of sound institutions other than those related to governance - for instance, sound financial market or commercial institutions, poor access to international capital markets, inefficient domestic market structure, perhaps low levels of social capital.¹⁹ We capture this by means of an effort productivity parameter, δ . While effort productivity is likely to reflect a range of institutional determinants such as those listed above, the quality of governance may also exert an influence. The empirical growth literature has suggested that the impact of policy intervention on output is improved under conditions of good governance.²⁰ Thus we

¹⁵There is an alternative attractive at first blush. If the performance measure is indirect, the final objective of aid, recipient output, seems a plausible candidate. Unfortunately recipient country output has a multivariate determination, and the link between aid and output is tenuous (output may fall or rise due to exogenous shocks unrelated to effort on the part of the recipient -eg. climatic shocks). Further, even relatively large changes in aid budgets may be difficult to detect statistically in an aggregate measure such as GDP. For these reasons the performance measure is constrained to the indirect measure of the unobservable input that is the objective of the incentive mechanism.

¹⁶Source of the mapping is left moot here. Our understanding is in the spirit of correlates, rather than causes. One interpretation is that good governance leads to an enabling environment under which effort is rewarded, hence acting as stimulus. An alternative is that strong effort will devote itself to the maintenance of sound governance as well as output. The functional representation of the text is in the spirit of the latter interpretation. An analogy from education is the use of a performance measure in the form of standardized test scores, as a means of stimulating underlying teacher effort. Such questions are the subject of an extensive empirical literature. For a recent examination of methodological issues involved, see Fedderke, Klitgaard and Akramov (2004).

¹⁷In the current context, we concern ourselves only with the question of whether governance is a reliable measure of effort. Error, ε , is due strictly to the imperfect link between governance and effort. It does not for instance represent a draw of a specific type of aid recipient, imperfectly observed. A separate valid concern is whether governance itself is reliably measured across countries. Concern about the reliability and validity of measures is expressed in Bollen (1991) and Inkeles (1991). The work of Kaufman et al (1999a, 1999b, 2002) has concerned itself with redress. See also the discussion in Klitgaard and Fedderke (1995) and Fedderke, Klitgaard and Akramov (2004).

¹⁸Note that the corrupt officials could be located either in the recipient or in the donor country distribution channels. Reality is likely to be some combination of the two, and the model allows for this. The crucial point is that the aid flow is diverted from the income of the aid recipient country. Swiss bank accounts are the obvious alternative destination.

¹⁹The distinction from the first form of slippage above is that in the present case good governance *is* a reflection of sound effort, whereas in the first form of slippage good governance does not necessarily reflect sound effort.

²⁰The suggestion comes from Isham, Kaufman and Pritchett (1997) who find that the impact of World Bank projects is

have $\delta(g)$, subject to the standard concavity assumption, $\delta_g > 0$, $\delta_{gg} < 0$.

To summarize our discussion thus far, we have:

$$\begin{aligned}
Y &= Y(e, K, k, \delta, \phi), Y_e > 0, Y_{ee} < 0, Y_K > 0, Y_{KK} < 0, Y_k > 0, Y_\delta > 0, Y_\phi > 0 \\
C_R &= C_R(e, \varepsilon), C_{R,e} > 0, C_{R,ee} > 0, C_{R,\varepsilon} > 0, C_{R,\varepsilon\varepsilon} > 0 \\
g &= g(e, \varepsilon), g_e > 0, g_{ee} = 0, g_\varepsilon > 0, g_{\varepsilon\varepsilon} = 0 \\
\delta &= \delta(g), \delta_g > 0, \delta_{gg} < 0 \\
\phi &= \phi(g), \phi_g > 0, \phi_{gg} < 0 \\
k &= \bar{F} + k(g, \beta, \mu), k_F = 1, k_{FF} = 0, k_g > 0, k_{gg} = 0 \\
C_D &= C_D(\beta), C_{D,\beta} > 0, C_{D,\beta\beta} > 0
\end{aligned} \tag{1}$$

where we adopt the convention of denoting constants by overbars. Hence aid that is not performance intensive is taken to be fixed, \bar{F} .²¹ For the sake of analytical traction, and in the absence of compelling evidence to the contrary, we also impose $Y_{eK} = Y_{ek} = Y_{ke} = Y_{gK} = Y_{Kk} = k_{Fg} = 0$.²²

We conclude the discussion of this section by clarifying the conceptual structure of the model. The model precludes the possibility of strategic action by the donor agency against the legislature, and of the aid recipient against the donor agency. Specifically, the aid recipient has no ability to have the aid donor agency alter β , and strict institutional separation of power between the donor agency and the legislature, ensures the independence of the legislature from strategic action on the part of the donor agency. Under these conditions the solution of the problem is Stackleberg. The aid recipient will make its choice of the optimal level of governance in response to an announcement of performance intensity of aid in governance, in the knowledge that it cannot alter the behaviour of the aid donor. The donor agency may thus make its choice in setting the optimal performance intensity of aid, treating the choice the aid recipient will make with respect to governance as given. Symmetrically, the legislature can treat the optimal choice of the aid donor as given in choosing the optimal size of the aid budget. Figure 1 illustrates.

INSERT FIGURE 1 ABOUT HERE.

2.1. Detailing the Decision Problems

Objective of the aid recipient is to maximize its own income, subject to the cost of effort. Since (some of) the governing elites in the aid recipient may be intent to appropriate aid for personal gain, corruption introduces a source of friction into the pursuit of the aid recipient country objective - without entirely subverting the maximization of income. This gives us the decision problem for the recipient country:

$$\max_{e, \varepsilon} V[e, \varepsilon] = \int_0^T [Y(e, K, k, \delta, \phi) - C_R(e, \varepsilon)] \exp[-\rho_R t] dt \tag{2}$$

where ρ_R denotes the recipient time rate of discount, and subject to relevant boundaries. We allow for effort and ε -measurement error as state variables.²³

We proceed under the assumption of a benevolent aid donor country, interested in increasing recipient country income. Recall that we postulated that the donor country had two institutions: the donor agency responsible for setting the degree of performance intensity of aid (β), and the legislature responsible for determining the magnitude of the aid granted and the criterion for performance intensity (g). The decision problem for the donor agency in setting β is the trade off between the increased recipient country income

improved under conditions of good governance. Fedderke, Klitgaard and Akramov (2004) and Fedderke, Klitgaard and Dutta (2004) both present more extensive and generalized statistical treatments of the point.

²¹Note that the fixed component of aid could also be thought of as aid employed for geo-political interests, rather than for the purpose of increasing aid recipient welfare.

²²Note that while the marginal effect of aid is thus independent of the level of effort, in equilibrium there will be a relationship between effort and the marginal effect of aid.

²³Capital stock may constitute an additional state, subject to recipient country intervention. Our abstraction is motivated by our focus on the link between governance and aid. In addition, capital and foreign direct investment are often constraints in developing nations, particularly those who are the intended targets of aid flows.

under the aid award formula the donor had committed to, and the cost of the aid provided from the donor perspective. The donor agency makes its decision in the knowledge that only $\beta + \mu$ is observed as signal by the aid recipient, and it is equally aware that governance is an imperfect measure of underlying effort, $g = g(e, \varepsilon)$. The donor agency is thus able to respond to information concerning changes in the efficiency of aid delivery from donor to recipient, $d\mu$, or in the accuracy of the governance measure, $d\varepsilon$, though it does not know the precise value that either μ , or ε , assumes in the case of any specific recipient. Provided the assumption of benevolence in the aid donor agency is satisfied, the donor decision problem is then to:²⁴

$$\max_{\beta} W[\beta] = \int_0^T [Y(e, K, k, \delta, \phi) - C_D(\beta)] \exp[-\rho_A t] dt \quad (3)$$

where ρ_A denotes the donor time rate of discount, and subject to relevant boundaries.

It now remains to detail the decision faced by the final budget granting authority - the legislature (Congress say). The objective is to maximize the income of the aid recipient by the aid k granted, subject to the cost of granting aid, and recognizing that the performance measure, in this instance governance, may itself be a source of utility to the legislature. This gives the decision problem for the legislature:

$$\max_k U[k] = \int_0^T U(Y, g, k) \exp[-\rho_L t] dt \quad (4)$$

with ρ_L representing the legislature's time rate of discount, and $U = U(Y, g, k)$ the legislature's utility function, such that $U_Y > 0$, $U_{YY} < 0$, $U_g > 0$, $U_{gg} < 0$, $U_k < 0$, $U_{kk} < 0$.²⁵

Use of a finite time horizon reflects the recognition of limited terms of office of administrations in leading donor countries, such that policy governing the provision of aid is subject to review and change after each term of office of the legislature in the donor country. Given the change in policy direction in the donor country with a change in administration (including whether aid is rendered performance intensive at all), optimization by the aid recipient in response to the performance target set, is over the term of office that the administration in the donor country holds.²⁶

2.2. First Order Conditions

Given the decision problem of the aid recipient, defined in terms of the two choice variables effort (e) and measurement slippage, (ε), the Euler equation first order conditions for an extremal provide:

$$\underbrace{\left(\frac{\partial Y}{\partial e} - \frac{\partial C_R}{\partial e} \right)}_{\substack{\text{net direct} \\ \text{marginal} \\ \text{return} \\ \text{on effort}}} + \underbrace{\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e}}_{\substack{\text{marginal impact} \\ \text{of effort; through} \\ \text{governance induced} \\ \text{aid}}} + \underbrace{\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial e}}_{\substack{\text{marginal impact} \\ \text{of effort; through} \\ \text{governance induced} \\ \text{productivity of effort}}} + \underbrace{\frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g} \frac{\partial g}{\partial e}}_{\substack{\text{marginal impact} \\ \text{of effort; through} \\ \text{governance induced} \\ \text{corruption reduction}}} = 0 \quad (5)$$

$$\underbrace{-\frac{\partial C_R}{\partial \varepsilon}}_{\substack{\text{marginal cost} \\ \text{of measurement} \\ \text{slippage}}} + \underbrace{\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial \varepsilon}}_{\substack{\text{marginal impact} \\ \text{of measurement} \\ \text{slippage;} \\ \text{through governance} \\ \text{induced aid}}} + \underbrace{\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial \varepsilon}}_{\substack{\text{marginal impact} \\ \text{of measurement} \\ \text{slippage;} \\ \text{through productivity} \\ \text{of effort}}} + \underbrace{\frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g} \frac{\partial g}{\partial \varepsilon}}_{\substack{\text{marginal impact} \\ \text{of measurement} \\ \text{slippage;} \\ \text{through corruption}}} = 0 \quad (6)$$

²⁴We introduce recipient country income directly into the objective functional of the problem. An extension would be to a von Neumann - Morgenstern utility formulation, though the core structure of the decision problem emerges also in our simpler formulation.

²⁵In the analysis which follows, unless its omission creates confusion, we suppress the subscript on the time rate of discount.

²⁶The term of office relevant to the optimization problem might be longer than the term of office held by a particular administration, to the extent that there is policy continuity. An extension of the present model would be to treat the optimization problem under infinite time horizons, with subjective transition probabilities of switching between alternative aid regimes held by the aid recipient. On the other side of the decision problem, future aid granted by the donor agency may be contingent on past performance of aid recipients even under alternative aid policy regimes - which would be relevant to the decision problem of the aid recipient. Here we abstract from the added complexity these extensions introduce.

Here $\left(\frac{\partial Y}{\partial e} - \frac{\partial C_R}{\partial e}\right)$ denotes the net direct marginal return on the change in effort undertaken to induce governance changes; $\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g}$ denotes the marginal impact of governance-induced aid changes on output; $\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g}$ denotes the marginal impact of governance-induced effort productivity changes on output; $\frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g}$ denotes the marginal impact of governance-induced lowered corruption on output. Given $\left[\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} + \frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} + \frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g}\right] \frac{\partial g}{\partial e}$, all three indirect marginal effects are ultimately driven through the aid-induced impact on effort.

The indirectness of the performance measure offers the aid recipient the opportunity to respond not only through effort, but by increasing the noise that inheres in the governance proxy of underlying effort. Such a response is subject to a marginal cost, $-\frac{\partial C_R}{\partial \varepsilon}$, but to the extent that $\frac{\partial g}{\partial \varepsilon} > 0$, the three marginal effects noted in conjunction with the recipients' effort response are again present. The consequence is that the performance intensity of aid has the consequence not only of raising the "true" underlying target, aid recipient effort, but of raising governance measures independently of effort, since all three marginal effects are also driven through measurement slippage induced governance changes.

Given the Stackleberg native of the model, the donor agency knows g^* , hence its responsiveness to the donor agency's choice of β . The Euler equation first order condition for an extremal in β then provides:

$$\underbrace{\left(\frac{\partial Y}{\partial e} \frac{\partial e}{\partial g} \frac{\partial g}{\partial \beta} - \frac{\partial C_D}{\partial \beta}\right)}_{\substack{\text{net effort induced return} \\ \text{on performance} \\ \text{intensity of aid}}} + \underbrace{\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial \beta}}_{\substack{\text{fundraising} \\ \text{effect}}} + \underbrace{\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial \beta}}_{\substack{\text{impact} \\ \text{of performance} \\ \text{intensity of aid} \\ \text{on productivity} \\ \text{of effort}}} + \underbrace{\frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g} \frac{\partial g}{\partial \beta}}_{\substack{\text{impact} \\ \text{of performance} \\ \text{intensity of aid} \\ \text{on corruption}}} = 0 \quad (7)$$

such that $\left(\frac{\partial Y}{\partial e} \frac{\partial e}{\partial g} \frac{\partial g}{\partial \beta} - \frac{\partial C_D}{\partial \beta}\right)$ represents the net marginal impact of increased recipient country output due to the incentive effect of the performance intensity of aid; $\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g}$ represents the marginal fundraising effect of increased recipient country governance in response to the performance intensity of aid; $\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g}$ denotes the marginal impact of governance-induced effort productivity changes on output; and $\frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g}$ denotes the marginal impact of governance-induced lowered corruption on output.

Implication of (7) is that the optimal choice of performance intensity of aid by the benevolent donor agency will exhaust all means of raising recipient country income - by exploiting the incentive effect that emanates from the performance intensity of aid, by exploiting the fundraising effect that it can exert on the budget setting organization (legislature) in the donor country, as well as the productivity of effort and corruption channels. Symmetrically, from (5) and (6) the optimizing aid recipient will similarly exploit all income opportunities from effort and governance noise.

Further, given the Stackleberg structure of our problem, the legislature is able to take both the behaviour of the aid recipient in choosing g^* and the behaviour of the donor agency in choosing β^* as given. The first order condition given by the Euler equation is now:

$$\underbrace{\frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e} \frac{\partial e}{\partial \beta}}_{\substack{\text{commitment effect :} \\ \text{marginal utility} \\ \text{of effort} \\ \text{impact of aid}}} + \underbrace{\frac{\partial U}{\partial g}}_{\substack{\text{own utility effect \&} \\ \text{development effect :} \\ \text{marginal utility} \\ \text{of improved} \\ \text{governance}}} + \underbrace{\frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial F}}_{\substack{\text{marginal utility} \\ \text{of directaid} \\ \text{impact}}} + \underbrace{\frac{\partial U}{\partial k}}_{\substack{\text{marginal disutility} \\ \text{of aid cost}}} = 0 \quad (8)$$

source of fundraising effect

with $\frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e} \frac{\partial e}{\partial \beta}$ capturing the marginal utility of budgetary expenditure on aid through changes in effort on the part of the aid recipient, $\frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial F}$ identifies the marginal utility of the direct impact of aid on recipient country income, $\frac{\partial U}{\partial g}$ the marginal utility of improved recipient country governance on the donor

legislature, and $\frac{\partial U}{\partial k}$ the marginal disutility of the aid cost. Jointly, $\frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e} \frac{\partial e}{\partial \beta}$ and $\frac{\partial U}{\partial g}$ are the source of the fundraising effect of aid.²⁷ Respectively they are the commitment developmental, and own utility effects we noted at the outset of section 2..

3. Incentive and Fundraising Effects

Given the structure of the problem, there are two immediate, and unsurprising bit of good news for the performance intensive policy intervention: growth enhancing effort in the aid recipient increases; and there exists a fund-raising effect of the policy intervention.

In particular, it follows from (5) that:

Proposition 1 (Effort Incentives) *In the presence of performance intensive aid allocation, the optimizing recipient country will increase effort and governance.*

Proof. Under performance intensive aid, from (5):

$$\left(\frac{\partial g}{\partial e}\right)_{PIA} = \frac{-\left(\frac{\partial Y}{\partial e} - \frac{\partial C_R}{\partial e}\right)}{\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} + \frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} + \frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g}}$$

where $(\partial g/\partial e)_{PIA}$ denotes the marginal governance effect of effort under performance intensive aid. Since under aid that is not performance intensive $\partial k/\partial g = 0$ by construction, $|(\partial g/\partial e)_{PIA}| < |(\partial g/\partial e)_{FA}|$ where $(\partial g/\partial e)_{FA}$ denotes aid that is not performance intensive. Given $g_{ee} < 0$, effort and governance under performance intensive aid has increased. ■

Thus, to the extent that the aid recipient responds to the indirect performance measure by raising effort, aid flows will increase and its output will rise. The improved governance may serve to increase the effectiveness of aid - by improving recipient country effort, by lowering corruption, and by improving own effort productivity. To the extent that improved governance delivers the transparency and accountability that allow for less wastage in the delivery of the aid flows, $\frac{\partial \phi}{\partial g} > 0$, and hence each dollar of aid would be more effective in raising recipient country income (since less is siphoned off to private offshore holdings). The indirect effect through effort productivity is of particular significance.²⁸ Where improved governance improves the productivity of own effort ($\frac{\partial \delta}{\partial g} > 0$), an additional benevolent impact on final recipient country output is opened up by the performance intensive aid, $(\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial e})$.

The fundraising effect arises immediately from the postulated utility function of the donor country legislature.

Proposition 2 (Fundraising Effect) *The optimal budget allocation, k^* , rises under performance intensive aid.*

Proof. From (8), where aid is not performance intensive, $\partial k/\partial g = 0$, such that the relevant first order condition requires that the marginal disutility of aid be set equal to the marginal utility of the direct aid impact, $\frac{\partial U}{\partial k} = \frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial F}$. Under performance intensive aid, (8) illustrates directly that a greater disutility of aid can be countenanced, such that $\frac{\partial U}{\partial k} = \frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e} \frac{\partial e}{\partial \beta} + \frac{\partial U}{\partial g} + \frac{\partial U}{\partial Y} \frac{\partial Y}{\partial k} \frac{\partial k}{\partial F}$. Hence $\frac{\partial k^*}{\partial g} > 0$. ■

²⁷Note that the fundraising effect is not conditional on the presence of g in the utility function of the legislature. The effort-contingent impact suffices to generate a endogeneity in the budget.

²⁸The analysis which follows demonstrates the significance of the $\frac{\partial \delta}{\partial g} > 0$ condition. See Propositions 8 through ???. The irony is that it is non-trivial to isolate it empirically. We have already noted the Dollar and Pritchett (1998) argument that it is indeed the case that $\frac{\partial \delta}{\partial g} > 0$, but equally the skepticism voiced by Easterly et al (2004). The analysis of Propositions 8 through ??? demonstrates tht the estimation difficulties may arise from the presence of strong non-linearities that are often dealt with poorly by standard estimators. Fedderke, Klitgaard and Akramov (2004) and Fedderke, Klitgaard and Dutta (2004) demonstrate the methodological estimation issues that require resolution in order to isolate that indeed $\frac{\partial \delta}{\partial g} > 0$, and strongly so in economic terms.

The implication is intuitive and immediate. Where the aid distributing policy intervention is rigorously and credibly associated with performance intensity, the aid budget becomes endogenous. The optimal aid budget from the perspective of the legislature setting the budget may increase as the aid recipient responds to the incentive to increase performance. Policy intervention that is performance intensive is thus associated with a *fundraising* effect, increasing the resources available for the policy intervention.

4. The Impact of Noise in Governance

When aid rewards governance rather than growth enhancing effort, one means of increasing aid flows is to increase the noisiness with which governance measures underlying effort.

Should the aid donor care?

The immediate answer is, of course: the optimizing aid recipient will increase effort (see proposition 1), but also noise in governance, and only the first of these is desired.

Proposition 3 (Measurement Error Incentive I) *In the presence of performance intensive aid allocation, the optimizing recipient country will increase governance measurement noise.*

Proof. Under performance intensive aid, from (6):

$$\left(\frac{\partial g}{\partial \varepsilon}\right)_{PIA} = \frac{\frac{\partial C_R}{\partial \varepsilon}}{\frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} + \frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} + \frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g}}$$

where $(\partial g/\partial \varepsilon)_{PIA}$ denotes the marginal governance effect of noise under performance intensive aid. Since under aid that is not performance intensive $\partial k/\partial g = 0$ by construction, $|(\partial g/\partial \varepsilon)_{PIA}| < |(\partial g/\partial \varepsilon)_{FA}|$ where $(\partial g/\partial \varepsilon)_{FA}$ denotes aid that is not performance intensive. Given $g_{\varepsilon\varepsilon} < 0$, governance noise under performance intensive aid has increased. ■

But the negative unintended consequence of the performance intensive policy intervention are of constrained importance. First, unless the relative cost of measurement error is dramatically smaller than that of effort, the fact that effort has a direct productivity impact on physical capital ensures that the relative return from effort is stronger than on measurement error.

Proposition 4 (Measurement Error Incentive II) *The incentive to raise measurement error is weaker than the incentive to raise effort, in the sense that the optimizing recipient country will ensure $\frac{\partial g}{\partial \varepsilon} > \frac{\partial g}{\partial e}$, provided only that the relative marginal cost of effort and measurement error, $(\partial C_R/\partial e - \partial C_R/\partial \varepsilon)$, are not strongly divergent.*

Proof. From (5) and (6):

$$\begin{aligned} \frac{\partial g}{\partial e} / \frac{\partial g}{\partial \varepsilon} &= \left(\frac{\partial C_R}{\partial e} - \frac{\partial Y}{\partial e} \right) / \frac{\partial C_R}{\partial \varepsilon} \\ &\geq 1 \\ \text{for } \frac{\partial Y}{\partial e} &\geq \frac{\partial C_R}{\partial e} - \frac{\partial C_R}{\partial \varepsilon} \end{aligned}$$

Given $g_{ee} < 0$, $g_{\varepsilon\varepsilon} < 0$, $\frac{\partial g}{\partial e} < \frac{\partial g}{\partial \varepsilon}$ for $(\partial C_R/\partial e - \partial C_R/\partial \varepsilon) \rightarrow 0$, and $\frac{\partial g}{\partial e} > \frac{\partial g}{\partial \varepsilon}$ for $(\partial C_R/\partial e - \partial C_R/\partial \varepsilon) \rightarrow \infty$. For $\partial C_R/\partial e \approx \partial C_R/\partial \varepsilon$, $\frac{\partial g}{\partial e} < \frac{\partial g}{\partial \varepsilon}$. ■

Crucial here is that measurement error has no direct positive impact on output - unlike underlying productive effort. The consequence is that unless the marginal cost of increasing measurement error lies significantly below that of increasing effort, the positive output impact of effort provides an added incentive to raise effort more than noise.

For the sake of further analytical traction on our problem, suppose that (1) is satisfied under:

$$Y(e, K, k, \delta, \phi) = e^\delta K^\alpha + \phi k, \quad 0 \leq \phi \leq 1, \quad 0 \leq \delta \leq 1, \quad e \geq 1, \quad (9)$$

$$C_R(e) = \theta e + \lambda e^2 + \vartheta e + \xi e^2, \quad \theta, \lambda, \vartheta, \xi > 0, \quad (10)$$

$$k = \bar{F} + bg, \quad b > 0, \quad (11)$$

$$= \bar{F} + (\beta + \mu)g, \quad \beta + \mu \geq 0, \quad \mu \sim iid(0, \sigma_\mu^2) \quad (12)$$

$$g = e\varepsilon, \quad \varepsilon \sim iid(1, \sigma_\varepsilon^2) \quad (13)$$

$$C_D = \gamma\beta + \psi\beta^2, \quad \gamma, \psi > 0 \quad (14)$$

satisfying the restrictions on functional form noted above. The specification of (13) presupposes the normalization of effort on minimum feasible effort, which we might think of as a baseline or subsistence contribution. The δ -parameter measures the effectiveness of recipient effort in improving output. The direct effectiveness of aid in increasing recipient income, independently of the incentive effects of aid, is captured by the ϕ -parameter.²⁹ Note that $d\phi > 0$ denotes a decrease in corruption, and hence an increased effectiveness of aid delivery. Convexity of the recipient cost function in effort is assured by the λ, ξ -parameterization. The illustration suppresses both $\delta(g)$ and $\phi(g)$. Justification rests on the analytical focus of the exposition. Since the aid donor wishes to improve growth-related effort on the part of the aid recipient, the indirect payoffs through lowered corruption and improved productivity of recipient effort are unintended though potentially welcome impacts, not the primary policy channel. The analysis which follows nevertheless considers the impact of both $d\delta$ and $d\phi$, from which the likely consequences of any impact of governance on either dimension can be inferred if required.

This gives us the decision problem for the recipient country:

$$\begin{aligned} \max E\{V[e, \varepsilon]\} &= \int_0^T E[Y(e, K, k, \delta, \phi) - C_R(e)] \exp[-\rho t] dt \\ &= \int_0^T E\left[e^\delta K^\alpha + \phi(\bar{F} + (\beta + \mu)e\varepsilon) - \theta e - \lambda e^2 - \vartheta e - \xi e^2\right] \exp[-\rho t] dt \end{aligned} \quad (15)$$

where E denotes the mathematical expectations operator. The Euler equation first order condition for the aid recipient for an extremal in effort is then:

$$\delta e^{\delta-1} K^\alpha + \phi \left(\beta + \int \mu f_\mu(\mu) d\mu \right) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - \theta - 2\lambda e = 0 \quad (16)$$

where $f_\mu(\mu)$ and $f_\varepsilon(\varepsilon)$ denote the probability density functions of μ, ε , respectively. Consider the special case in which $\delta = 1$, such that we have increasing returns provided only that $\alpha > 0$ (we consider $0 \leq \delta < 1$ below). This provides the optimal solution in effort, and by inference in governance for the developing country:³⁰

$$\begin{aligned} E\{e^*\} &= \frac{\phi \left(\beta + \int \mu f_\mu(\mu) d\mu \right) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon + K^\alpha - \theta}{2\lambda} \\ &= \frac{\phi\beta + K^\alpha - \theta}{2\lambda} \text{ for } \mu \sim (0, \sigma_\mu^2), \quad \varepsilon \sim (1, \sigma_\varepsilon^2) \end{aligned} \quad (17)$$

$$\begin{aligned} E\{g^*\} &= E\{e^*\} \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \\ &= \frac{\phi \left(\beta + \int \mu f_\mu(\mu) d\mu \right) \left[\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \right]^2 + (K^\alpha - \theta) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon}{2\lambda} \\ &= \frac{\phi\beta(1 - \sigma_\varepsilon^2) + (K^\alpha - \theta)}{2\lambda} \text{ for } \mu \sim (0, \sigma_\mu^2), \quad \varepsilon \sim (1, \sigma_\varepsilon^2) \end{aligned} \quad (18)$$

²⁹Linearity of Y in k in expression (9) may appear to violate our introductory remarks. Since we have a single aid recipient, the need to exclude linearity is now absent, since all aid will of necessity be allocated to the single recipient.

³⁰Note that since $\frac{\partial E\{e^*\}}{\partial \beta} > 0$, $\frac{\partial E\{g^*\}}{\partial \beta} > 0$, proposition 1 certainly holds.

The decision problem of the aid recipient includes the choice of measurement error in the link between effort and governance. This occurs where the aid recipient can change governance independently of effort. Under such circumstances from the Euler equation first order condition for an extremal in measurement error (ε) under substitution of (17) we have:

$$E\{\varepsilon^*\} = \frac{\phi(\beta + \int \mu f_\mu(\mu) d\mu) E\{e^*\} - \vartheta}{2\xi} \quad (19)$$

$$\therefore E\{\varepsilon^*\} = \frac{\phi(\beta + \int \mu f_\mu(\mu) d\mu) (K^\alpha - \theta) - 2\vartheta\lambda}{4\lambda\xi - \phi^2(\beta + \int \mu f_\mu(\mu) d\mu)^2} \quad (20)$$

Provided the recipient country chooses the optimal level of effort given the aid incentives (see 17), and for the case of $\delta = 1$ (again we consider $0 \leq \delta < 1$ below), this provides the donor with the decision:

$$\max E\{W[\beta]\} = \int_0^T E\left[\left(K^\alpha + \phi\left(\beta + \int \mu f_\mu(\mu) d\mu\right) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon\right) E\{e^*\} + \phi\bar{F} - \gamma\beta - \psi\beta^2\right] \exp[-\rho t] dt \quad (21)$$

with ρ denoting the relevant donor time rate of discount, again subject to relevant boundaries, and with the finite time horizon reflecting the relevant planning horizon of the incumbent administration. The Euler equation first order condition for an extremal in β provides the optimal performance intensity of aid:

$$E\{\beta^*\} = \frac{\phi(\theta - 2K^\alpha) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - 2\phi^2 \int \mu f_\mu(\mu) d\mu \left[\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon\right]^2 + 2\lambda\gamma}{2\phi^2 \left[\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon\right]^2 - 4\lambda\psi} \quad (22)$$

The combination of (18) and (22) then allows us to identify the governance level that will be realized in the recipient country.

For the sake of analytical clarity, it is useful to consider the case in which donor agency cost is fixed, \bar{C}_D , instead of convex in performance intensity, β . The simplification aids tractability, though we treat the implications of convex donor agency cost explicitly where they impact. Under fixed donor agency cost optimal performance intensity of aid reduces to:

$$E\{\beta^*\} = \frac{\theta - K^\alpha}{2\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon} - \int \mu f_\mu(\mu) d\mu \quad (23)$$

A number of immediate implications follow that suggest that while there may exist a governance noise response to the performance intensity of aid, this is of limited significance from the perspective of the aid donor.

First, poor aid recipients are least likely to respond by increasing governance noise, or be disadvantaged by increasing performance intensity of aid.

Proposition 5 (Poor Recipients) *Poor aid recipient countries are least likely to increase measurement noise in governance in response to performance intensive aid. Further, under convex adjustment costs, optimal performance intensity of aid rises even in the presence of rising governance noise, but not for poor countries.*

Proof. Given (20), that the poorest countries are least likely to increase measurement noise follows from $\frac{\partial E\{\varepsilon^*\}}{\partial \beta} = \frac{(K^\alpha - \theta)[4\lambda\xi + \phi^2(\beta + \int \mu f_\mu(\mu) d\mu)^2] - 4\vartheta\lambda\phi(\beta + \int \mu f_\mu(\mu) d\mu)}{[4\lambda\xi - \phi^2(\beta + \int \mu f_\mu(\mu) d\mu)^2]^2} < 0$ for $K < \left[\frac{4\vartheta\lambda\phi(\beta + \int \mu f_\mu(\mu) d\mu)}{4\lambda\xi + \phi^2(\beta + \int \mu f_\mu(\mu) d\mu)^2} + \theta\right]^{1/\alpha}$, such that only countries with capital stock in excess of a minimum threshold level respond to the performance intensity of aid by increasing governance noise. Under convex donor agency cost, the greater the expected measurement error ($E(\varepsilon)$) of pure underlying effort (e) by means of the governance proxy (g) on the part of the donor agency, the higher the optimal performance intensity of the benevolent donor agency, provided only that the threshold level of capital $K > \left(\frac{2\lambda\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon (\gamma - 2\psi \int \mu f_\mu(\mu) d\mu)}{2\phi^2 \int \varepsilon^2 f_\varepsilon(\varepsilon) d\varepsilon + 4\lambda\psi} + \frac{\theta}{2}\right)^{1/\alpha}$ is met. This follows

under (22), such that $\frac{\partial E\{\beta^*\}}{\partial \varepsilon} = -2\phi \frac{(\theta - 2K^\alpha)(\phi^2[\int \varepsilon f_\varepsilon(\varepsilon)d\varepsilon]^2 + 2\lambda\psi) - 4\lambda\phi \int \varepsilon f_\varepsilon(\varepsilon)d\varepsilon(2\psi \int \mu f_\mu(\mu)d\mu - \gamma)}{[2\phi^2[\int \varepsilon f_\varepsilon(\varepsilon)d\varepsilon]^2 - 4\lambda\psi]^2} \geq 0$ for $K \geq \left(\frac{2\lambda\phi \int \varepsilon f_\varepsilon(\varepsilon)d\varepsilon(\gamma - 2\psi \int \mu f_\mu(\mu)d\mu)}{2\phi^2 \int \varepsilon^2 f_\varepsilon(\varepsilon)d\varepsilon + 4\lambda\psi} + \frac{\theta}{2}\right)^{1/\alpha}$. ■

The result is surprising, since under performance intensity of aid the aid recipient has an incentive to respond by increasing both constituent components of the governance measure - effort and measurement error. The return on true effort is certainly higher than on governance noise (simply compare $\partial Y/\partial e$ and $\partial Y/\partial \varepsilon$) - but this is so for both poor and richer aid recipients, and indeed increases in the size of the capital stock. The reason for the result is instead that at very low levels of capital, the return on effort is relatively low (due to the scale effect on effort returns in capital), such that equilibrium effort will be correspondingly low. But under these conditions, it follows that in fact the return on governance noise may turn out to be negative, conditional on the cost structure attaching to the generation of governance noise. Since $\partial Y/\partial \varepsilon = \phi(\beta + \int \mu f_\mu(\mu)d\mu)E\{e^*\} - \vartheta - 2\xi \int \varepsilon f_\varepsilon(\varepsilon)d\varepsilon$, $\partial Y/\partial \varepsilon < 0$ for $E\{e^*\} > [\phi(\beta + \int \mu f_\mu(\mu)d\mu)E\{e^*\} - \vartheta]/2\xi$. Under rising capital stock endowment, the risk of negative returns from governance error diminishes, and both sources of increased aid flow are exploited actively. Given the lower risk of exploitation of governance measurement error by poor countries, it follows that the aid donor can increase reliance on performance intensity of aid for poor countries.

Second, given only a minimum level of donor agency efficiency, governance noise itself may come to increase optimal effort on the part of the aid recipient.

Proposition 6 (Slippage 1: Donor Information Asymmetry) *Governance shocks raise optimal effort and governance if donor agency efficiency lies above a threshold level. Increased variance in measurement error (σ_ε^2), leaves optimal recipient country effort unaffected, and lowers recipient country optimal governance levels.*

Proof. Specifically, positive governance shocks, ($\varepsilon > 0$): (a) raise optimal effort if $E(\mu) > -\phi\beta$; and (b) raise optimal governance if $\varepsilon > \frac{\theta - K^\alpha}{2\phi(\beta + \int \mu f_\mu(\mu)d\mu)}$. Given (17), $\frac{\partial E\{e^*\}}{\partial \varepsilon} = \frac{\phi(\beta + \int \mu f_\mu(\mu)d\mu)}{2\lambda} > 0$ for $\int \mu f_\mu(\mu)d\mu > -\phi\beta$. Given (18), $\frac{\partial E\{g^*\}}{\partial \varepsilon} = \frac{2\phi(\beta + \int \mu f_\mu(\mu)d\mu)\varepsilon + (K^\alpha - \theta)}{2\lambda} > 0$ for $\varepsilon > \frac{\theta - K^\alpha}{2\phi(\beta + \int \mu f_\mu(\mu)d\mu)}$. On the impact of error variance, from (17), $\frac{\partial E\{e^*\}}{\partial \sigma_\varepsilon^2} = 0$, and given (18), $\frac{\partial E\{g^*\}}{\partial \sigma_\varepsilon^2} < 0$. ■

Thus optimal effort levels will respond to governance shocks only if expected donor agency inefficiency does not fall below $-\phi\beta$, though since $-\phi\beta < 0$, there is an effort response from the aid recipient even where the donor agency is inefficient (in the sense that $E(\mu) < 0$). Moreover, the greater expected donor agency efficiency, the more readily will any given governance shock exceed the critical size required for optimal governance to rise. The positive implication for the performance intensive policy intervention in the presence of measurement error, is that even though there may be an attempt on the part of the aid recipient to raise the noise in the measured performance dimension in response to the performance intensity of intervention (i.e. to raise ε in response to β , see Proposition 3), as long as the efficiency of the aid donor meets minimum threshold levels, increased governance shocks will themselves come to raise optimal effort on the part of the aid recipient. By way of corollary, note that the minimum threshold level that donor agency efficiency has to meet is more readily attained the *stronger* the performance intensity of the aid (β).

The result is thus the counter-intuitive one that the noise response on the part of the aid recipient is of diminished significance from the perspective of the aid donor, because the noise response may reinforce the desirable effects on effort and governance in the aid recipient. The requirement for realizing this virtuous linkage is that donor agency efficiency meets a minimum threshold level - strengthening the importance of effective executive dispensation of aid.

We conclude this section by noting that for purposes of policy, the most significant results are that performance intensity of aid allocation does raise noise in the governance measure. However, the incentive to raise effort is likely to be stronger than that to raise noise, and the incentive to raise noise is likely to be weakest in the poorest aid recipients. Finally, provided that the donor agency is sufficiently efficient, measurement error itself will serve to raise optimal effort in the aid recipient. While monitoring noise in

the governance measure of the aid recipient may be important for the aid donor, self-monitoring also carries important benefits.

5. A Tension Between the Decisions of Aid Donors and Recipients

Aid is not granted under static conditions. The state of the world is subject to shocks, which may come to alter the decision problem of both the aid recipient, and its donor, irrespective of the mechanism with which aid is dispensed.

An obvious comparative static concern in our context is therefore to detail the behavioural response of aid recipients and donors to changes in the underlying decision parameters and variables. In doing so, it is particularly useful to note any differentials in the behavioural response on the part of the two types of agent.

In doing so, we note that the model, despite its emphasis on circumstances that have *eliminated* any misalignment of incentives between aid donors and recipients, suggests that aid donors are likely to rely on performance intensity of aid precisely where such a reliance is least successful. In doing so, they are responding to their benevolent objective of improving the lot of the aid recipient - when things get worse in the aid recipient, the donor attempts to compensate by a more aggressive aid dispensation. Unfortunately what lurks for the benevolent aid donor in its home constituency, is the threat of accusations of wastage of resources on lost causes.

Be begin by noting that:

Proposition 7 (Recipient vs. Donor) *Optimizing benevolent aid donors are most likely to increase reliance on performance intensity of aid, where the performance intensity of aid is least likely to have a strong impact in the aid recipient. This holds with respect to the cost structure of effort in the aid recipient, corruption in the aid recipient, productive capacity in the aid recipient, and with respect to the efficiency of the donor agency.*

Proof. We proceed sequentially. First, there is a negative effort and governance response in optimizing recipient countries to increased effort costs (λ, θ) , but an increasing cost structure of effort $(d\theta > 0)$, raises the optimal performance intensity of aid for the benevolent donor agency: given (17, 18), $\frac{\partial E\{e^*\}}{\partial \theta}, \frac{\partial E\{g^*\}}{\partial \lambda} < 0$ and $\frac{\partial E\{g^*\}}{\partial \theta}, \frac{\partial E\{g^*\}}{\partial \lambda} < 0$; given (22), (23), $\frac{\partial E\{\beta^*\}}{\partial \theta} > 0$. Second, there is a positive effort and governance response in optimizing recipient countries to a decrease in corruption - or any other improvement in the direct effectiveness of aid (ϕ) . Under fixed donor agency costs, rising corruption in the recipient country $(d\phi < 0)$, raises the optimal performance intensity of aid for the benevolent donor agency. Given $\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon > 0$, under convex donor agency costs, rising corruption in the recipient country $(d\phi < 0)$, raises the optimal performance intensity of aid for the benevolent donor agency, provided $K < \left[\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \left(2 \int \mu f_\mu(\mu) d\mu - \frac{\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon}{4\lambda\psi} + \frac{\gamma}{\psi} \right) + \frac{\theta}{2} \right]^{1/\alpha}$. Given (17, 18), $\frac{\partial E\{e^*\}}{\partial \phi} > 0$, $\frac{\partial E\{g^*\}}{\partial \phi} > 0$. Given (23), $\frac{\partial E\{\beta^*\}}{\partial \phi} < 0$. From (22),

$$\frac{\partial \beta^*}{\partial \phi} = \frac{2\phi \left[\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \right]^2 \left[\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - 4\lambda\gamma \right] - 4\lambda\psi(\theta - 2K^\alpha) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - 16\phi\lambda\psi \int \mu f_\mu(\mu) d\mu \left[\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \right]^2}{\left[2\phi^2 \int \varepsilon^2 f_\varepsilon(\varepsilon) d\varepsilon - 4\lambda\psi \right]^2} < 0$$

if $K < \left[\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \left(2 \int \mu f_\mu(\mu) d\mu - \frac{\phi \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon}{4\lambda\psi} + \frac{\gamma}{\psi} \right) + \frac{\theta}{2} \right]^{1/\alpha}$, given $\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon > 0$. Third, the greater the productive capacity of the recipient country (K) , the greater the incentive in optimizing recipient countries for increased effort and good governance. The greater the productive capacity of the aid recipient (K) , the lower the optimal performance intensity of the benevolent donor agency. Given (17, 18), $\frac{\partial E\{e^*\}}{\partial K} > 0$, $\frac{\partial E\{g^*\}}{\partial K} > 0$. Given (22), (23), $\frac{\partial E\{\beta^*\}}{\partial K} < 0$. Finally, gains in bureaucratic efficiency on the part of the donor agency (μ) , generate a higher optimal level of effort and governance in the optimizing aid recipient. The greater the inefficiency of aid delivery $(d\mu < 0)$, the greater the optimal performance intensity of the benevolent donor agency. Given (17, 18), $\frac{\partial E\{e^*\}}{\partial \mu} > 0$, $\frac{\partial E\{g^*\}}{\partial \mu} > 0$. Given (22), (23), $\frac{\partial E\{\beta^*\}}{\partial \mu} < 0$. ■

In the case of the donor agency, while these results may appear counterintuitive, they are a direct consequence of assuming that the division of power in the donor country is successful in rendering the donor agency benevolent: interested purely in maximizing the recipient country output subject to its own cost of operation. Any factor that serves to lower income in the aid recipient, be this increased cost of effort, the presence of corruption which serves to divert aid flows,³¹ low productive capital capacity to generate output, or where the aid donor is itself inefficient in channeling aid to the intended recipients, triggers a counter-response which attempts to reverse the negative impact on aid recipient productivity by strengthening the incentive effect of performance intensive aid.

Conversely, the aid recipient responses are a consequence of constraints on the behaviour of the aid recipient. Thus the net effect of incentives to improve effort and governance through performance intensity of aid, will depend crucially on how costly (λ, θ) it is for the potential aid recipient to respond. Where substantial cost barriers are present, observed effects may be disappointing. Similarly, the presence of corruption in the aid recipient will limit the incentive effects of the performance intensity of aid, while to the extent that improved governance leads to gains in anti-corruption activity through transparency and accountability say, the incentive effect of performance intensity of aid on effort and governance is enhanced.³² For the impact of the donor agency efficiency, since the aid recipient cannot distinguish between the true underlying performance intensity of aid (β) , and the extent of the slippage that may result from bureaucratic inefficiency (μ) , an increase in either performance intensity or donor agency efficiency will elicit an effort/governance response. Conversely, bureaucratic inefficiency in the donor agency lowers optimal effort and governance in the recipient country. Finally, the greater the productive capacity of the aid recipient, the greater the opportunity cost of not ensuring the realization of the output potential through poor effort/governance.³³ A significant corollary to follow is that the incentive effect that performance intensity of aid carries, wanes with rising productive capacity in the recipient country. The opportunity cost to poor effort renders the existence of poor effort/governance less likely independently of the performance intensity of aid.

The results of this section help demonstrate why the activities of donor agencies may often face considerable public disaffection in donor country voting constituencies. Attempts to increase aid flows to recipient countries through changed performance intensity of aid (since this is the only means at the disposal of the donor agency to change aid flows) are targeted to recipients with low productive capacity, where effort responses may be slow because costly, where corruption is rife, and to counter the inefficiency of the donor agency.³⁴

It is not difficult to understand that this may seem perverse to voters - with the actions of government agencies appearing hell-bent on maximizing budgets precisely where this appears custom made to be wasteful in the sense of being targeted at circumstances where expenditure is known to be relatively ineffective. In fact, in the current case we have demonstrated that such apparently perverse behaviour is precisely the result of benevolent action on the part of the donor agency - or rather the use of performance intensive aid precisely when a strong *incentive* is needed to secure a response on the part of the recipient, which in turn of course holds for those recipients that are corrupt, inefficient, and have low productive capacity.

But the donor agency response is also perverse in a deeper sense. A number of those factors that are most suited to raising the optimal level of governance, are precisely those that lower the donor's likelihood of encouraging governance through performance intensity of aid. Strictly these include cost of effort, the productive capacity of the aid recipient, the efficiency of aid delivery, while corruption and measurement error also feature. The reassuring aspect of this finding is that the introduction of performance intensity of policy intervention does not lead to the abandonment of the least advantaged. Provided that the executive authority

³¹The only nuance here is that in the presence of convex donor agency costs, where the donor agency is inefficient (in the sense of $\int \mu f_{\mu}(\mu) d\mu < 0$), increased corruption in the aid recipient may lower performance intensity of aid.

³²Note that this captures in some measure the impact of allowing $\delta(g)$.

³³Performance intensity of aid will also increase the marginal product of aid recipient country capital stock, since from (1), $\partial Y/\partial K > 0$. The implication is that the aid recipient country thus has an added incentive to improve growth performance, by increasing the return on capital stock at the margin, hence the level of the optimal capital stock and output.

³⁴This leaves open the question of whether the response by the donor agency is *ex post* or *ex ante*. The *ex post* response to the detection of mischief of toughening up the performance criterion may be the more realistic, since it is not easy to see how the donor agency would know ex ante how much the recipient will cheat.

(here the donor agency) is benevolent in the sense of being focussed on the intended policy outcome rather than its own strategic interest, it proves to employ performance intensive intervention more aggressively for aid recipients that are weak in the sense of facing high cost of effort, low productive capacity, and corruption, than for recipients that are strong in these dimensions.

6. The Impact of Aid Recipient Own Productivity

The analysis thus far has ignored variability in the aid recipient's own productivity. The question we face now is to what extent the level of efficiency in production by the aid recipient impacts on the decision problems of both the recipient and the donor agency.

Consider the sensitivity of optimal governance choices to δ - that is the impact of the fourth policy slippage identified in the formulation of this paper's problem.³⁵ Thus far we have proceeded under the assumption that $\delta = 1$, for both recipient and donor decision problems. For generality we now consider $0 \leq \delta < 1$.

The case for $\delta = 0$ follows immediately from equation (16), as:

$$\begin{aligned} E\{e^*\} &= \frac{\phi(\beta + \int \mu f_\mu(\mu) d\mu) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - \theta}{2\lambda} \\ &= \frac{\phi\beta - \theta}{2\lambda} \text{ for } \mu \sim (0, \sigma_\mu^2), \varepsilon \sim (1, \sigma_\varepsilon^2) \end{aligned} \quad (24)$$

$$\begin{aligned} E\{g^*\} &= e^* \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \\ &= \frac{\phi(\beta + \int \mu f_\mu(\mu) d\mu) [\int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon]^2 - \theta \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon}{2\lambda} \\ &= \frac{\phi\beta(1 - \sigma_\varepsilon^2) + (K^\alpha - \theta)}{2\lambda} \text{ for } \mu \sim (0, \sigma_\mu^2), \varepsilon \sim (1, \sigma_\varepsilon^2) \end{aligned} \quad (25)$$

All propositions continue to hold, with two exceptions. Under $\delta = 0$ the scale effect in own resources identified by proposition (7) is no longer present, since own effort is unable to impact on output. The incentive to improve output by increasing the impact of the own capital stock is therefore eliminated, and improvements in governance are only able to impact on final output by altering the direct effectiveness of aid. Second, for governance shocks (ε), the threshold level that the positive governance shock has to meet for the optimal level of governance to increase rises, modifying proposition (6). The increase in the threshold level arises since the positive pay-off that attaches to effort due to the own scale of production (K^α) is eliminated under $\delta = 0$.

This leaves the possibility of $0 < \delta < 1$. Table 1 reports numeric solutions for g^* under the parameterization, $\theta = 1$, $\lambda = 0.001$, $\alpha = 1$, $\phi = 1$, $K = 1$, $E(\varepsilon) = 1$, $E(\mu) = 0$.³⁶ Figure 2 provides a visual representation. Four core implications stand out from the evidence. We summarize:

Proposition 8 (Own Effort) *Highest absolute levels of governance emerge where both performance intensity of aid ($\beta \rightarrow 1$), and the own effort of the recipient country is strong ($\delta \rightarrow 1$). Specifically: (a.) Increasing effectiveness of recipient effort as measured by δ , is associated with increases in the optimal level of governance. (b.) The impact of the performance intensity of aid (β), on the optimal governance level g^* , becomes proportionately weaker, the stronger the effectiveness of recipient own effort (δ). (c.) The impact of increasing effectiveness of recipient effort (δ) on the optimal governance level g^* , becomes proportionately weaker, the stronger the performance intensity of aid (the greater is β).*

³⁵We restrict the analysis to the $0 < \delta \leq 1$ range, on the presumption that increasing returns in effort alone are not feasible. Empirical evidence corroborates.

³⁶Strictly, the polynomial leading to the governance solution has a second equilibrium at zero governance. Since this implies an absence of all effort on the part of the recipient of aid, hence no production or income, we exclude this case as economically trivial. Note further that under $\alpha = 1$, $\delta > 0$, we necessarily face increasing returns. However, under $\alpha < 1$ the substantive conclusions noted below are not affected.

Under $d\delta > 0$, returns to own effort increase since the marginal product of capital is raised. The increased incentive to raise effort maps into improved governance.

The proportional impact of increasing δ is illustrated by the ratio of g^* under $\beta = 1$ to g^* under $\beta = 0.1$, five times higher under $\delta = 0.001$ than under $\delta = 1$. The intuition is straightforward. Where own effort is productive, the aid recipient has an incentive to increase effort (mapped into governance) independently of the incentive provided by the performance intensity of aid. While the incentive provided by aid does serve to further raise optimal governance, the impact is proportionately less dramatic than in the case of unproductive own effort. $\frac{\partial^2 g^*}{\partial \delta^2} < 0$.

The implication is that where own effort is unproductive ($\delta \rightarrow 0$), increased performance intensity of aid ($d\beta > 0$) is proportionately at its most effective, given the negative impact of $\delta \rightarrow 0$ on the marginal product of capital. Figure 2 illustrates the increase in optimal governance over the $0 \leq \delta \leq 1$ range for our parameterization for $d\beta > 0$. Raising income through aid by means of governance compliance, is the most immediate means of improving income. Reliance on performance intensity of aid may thus be desirable precisely where the aid recipient has low own effort productivity.

Recall that $\delta \rightarrow 1$ carries with it the likelihood of increasing returns to scale. More plausible may be $0 < \delta \leq 1 - \alpha$. The preceding discussion suggests that this may well enhance the incentive effects of the performance intensity of aid.

The proportional impact of increasing β is illustrated by the ratio of g^* under $\delta = 1$ to g^* under $\delta = 0.001$, five times higher under $\beta = 0.1$ than under $\beta = 1$. Intuition here follows from the fact that strong performance intensity of aid ($\beta \rightarrow 1$) already provides an incentive to good governance, such that increases in the productivity of own effort ($d\delta > 0$), while raising optimal governance further, have a smaller proportional impact.

Dramatic governance improvements occur under the combination of own effort effectiveness ($\delta \rightarrow 1$), and performance intensity of aid ($\beta \rightarrow 1$).

One policy response that follows is that aid should incentivize good governance - but help in improving the impact of own effort would help to increase the desired pay-off.³⁷ Performance intensity of aid targeted directly at improving governance, while useful in raising governance particularly under low own effort productivity, alone does not capture the full potential gains in effort and governance. This is achieved only when own effort productivity is raised also, opening a role for aid providing technical assistance in addition to performance intensive aid.

Proposition 8 serves to demonstrate the importance of the effort productivity channel, $\frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial e}$, noted in the discussion following Proposition 1. Maximum aid impact is reserved for the use of performance intensive aid *jointly* with technical assistance.

INSERT TABLE 1 ABOUT HERE.

INSERT FIGURE 2 ABOUT HERE.

These findings lead to a conjecture concerning the use of performance measures in policy: performance intensity of aid maximizes its impact under conditions where it is supplemented by technical assistance to improve the effectiveness of own effort by the aid recipient.

7. The Impact of Adjustment Costs

Thus far the analysis has been essentially static. Linearity in the time rate of change of decision variables has ensured that the decision problems have been degenerate in the dynamic sense.

This is clearly an abstraction in the current context. The analysis thus far has employed a cost structure for the aid recipient which reflected the impact of effort, with $C_{R,e} > 0$, $C_{R,ee} > 0$. We noted in the preceding discussion that the adoption of performance intensity of aid had an impact on the level of governance that the optimizing aid recipient would adopt, deriving this implication in terms of comparative statics. Yet *changing*

³⁷Objective of the aid would be to provide technical assistance in order to raise the productivity of own effort in the aid recipient country. This might take the form of technology transfers, human capital transfers, training assistance, etc.

the level of effort (and by inference governance) in the aid recipient country is unlikely to be costless.³⁸ To reflect this, we now posit not only that $C_{R,e} > 0, C_{R,ee} > 0$, but also that $C_{R,\dot{e}} > 0, C_{R,\ddot{e}\dot{e}} > 0$.

By contrast, for the donor agency to alter the degree of performance intensity of aid, $d\beta$, is essentially costless. Perhaps somewhat less plausibly, we also take the cost of altering the aid budget, dk , to be zero. While budget debates are often notoriously vexed, relative to altering governance structures such costs are negligible. This explains our choice of emphasizing the adjustment costs of the aid recipient.

The structure of the decision problem remains unaltered from (2). Given the additional argument in the cost function, however, the Euler equation now comes to reflect the time rate of change of the governance variable also. In general specification we have:

$$\left(\frac{\partial Y}{\partial e} - \frac{\partial C_R}{\partial e}\right) + \frac{\partial Y}{\partial k} \frac{\partial k}{\partial g} \frac{\partial g}{\partial e} + \frac{\partial Y}{\partial \delta} \frac{\partial \delta}{\partial g} \frac{\partial g}{\partial e} + \frac{\partial Y}{\partial \phi} \frac{\partial \phi}{\partial g} \frac{\partial g}{\partial e} - \underbrace{\frac{d}{dt} \left(\frac{\partial C_R}{\partial \dot{e}} \right)}_{\substack{\text{marginal cost} \\ \text{impact of} \\ \text{effort change}}} = 0 \quad (26)$$

The structure of the Euler remains symmetrical to that faced by the aid recipient in the absence of adjustment costs, except for the appearance of the marginal cost of effort change impact $\frac{d}{dt} \left(\frac{\partial C_R}{\partial \dot{e}} \right)$. The optimal time path in effort, and intertemporal level of effort thus requires that the marginal cost of effort change must be compensated by the net direct marginal return on effort and the marginal impact of aid on effort.

Again, for purposes of illustration, suppose that in addition to (9) through (14), we have:

$$C_R(e) = \theta e + \lambda e^2 + \varphi \dot{e} + \zeta \dot{e}^2 + \vartheta \varepsilon + \xi \varepsilon^2, \quad \theta, \lambda, \varphi, \zeta, \vartheta, \xi > 0, \quad (27)$$

and let $e(0) = e_0$, with the fixed time horizon T , $e(T)$ free. The Euler equation first order condition is now:

$$\ddot{e} - \rho \dot{e} - \frac{\lambda}{\zeta} e = \frac{1}{2\zeta} \left(\rho \varphi - (K^\alpha - \theta) - \phi \left(\beta + \int \mu f_\mu(\mu) d\mu \right) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon \right) \quad (28)$$

giving the intertemporal equilibrium:

$$\bar{e} = \frac{1}{2\lambda} \left((K^\alpha - \theta) + \phi \left(\beta + \int \mu f_\mu(\mu) d\mu \right) \int \varepsilon f_\varepsilon(\varepsilon) d\varepsilon - \rho \varphi \right) \quad (29)$$

and optimal time path:

$$\begin{aligned} e^*(t) &= A_1 \exp \left[\frac{1}{2} \left(\rho + \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] t + A_2 \exp \left[\frac{1}{2} \left(\rho - \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] t + \bar{e} \\ \text{s.t. } e^*(0) &= e_0 \\ 0 &= \left[\frac{\varphi}{\varepsilon} + \frac{2\zeta}{\varepsilon^2} \dot{g} \right] \exp[-\rho T] \end{aligned} \quad (30)$$

with A_1, A_2 , two arbitrary constants.

It follows that:

Proposition 9 (Non-monotonicity) *The general class of optimal time paths in effort, $e^*(t)$, is non-monotone in time.*

³⁸In terms of more general policy considerations, nor are changes in educational systems, health systems, or the provision of federal services costless.

Proof. Since:

$$\begin{aligned} \frac{\partial e^*(t)}{\partial t} &= \left[\frac{1}{2} \left(\rho + \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] A_1 \exp \left[\frac{1}{2} \left(\rho + \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] t \\ &\quad + \left[\frac{1}{2} \left(\rho - \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] A_2 \exp \left[\frac{1}{2} \left(\rho - \sqrt{\rho^2 + \frac{4\lambda}{\zeta}} \right) \right] t \\ \frac{\partial e^*(t)}{\partial t} &\geq 0 \\ \text{for } t &\geq \frac{\ln \left[\left\{ A_2 \left(\sqrt{\rho^2 + \frac{4\lambda}{\zeta}} - \rho \right) \right\} / \left\{ A_1 \left(\sqrt{\rho^2 + \frac{4\lambda}{\zeta}} + \rho \right) \right\} \right]}{\sqrt{\rho^2 + \frac{4\lambda}{\zeta}}} \end{aligned}$$

■

This is potentially of considerable practical policy importance. The implication is that the optimal time path in effort on the part of the aid recipient is not only non-linear, but non-monotonic. Thus it is feasible that the optimal time path of adjustment, on the part of an aid recipient that is attempting to increase the optimal intertemporal level of effort in responding to the performance intensity of aid, is such that effort initially gets worse, before it gets better. Figure 3 provides an illustration for our example - with effort falling before rising to the intertemporal equilibrium.

INSERT FIGURE 3 ABOUT HERE.

The difficulty for the donor agency, and the legislature, is that it may appear as if the policy is failing, immediately after implementation. Even though things are bound to improve, and improve substantially, it appears as if the policy not only brings about changes in effort, and by extension (given 1) in governance, but in precisely the wrong direction. What is more, the case in which things gets worse before they improve is very difficult to differentiate from that in which things collapse. For those who are on the receiving end of the policy intervention risk aversion is easy to understand and sympathize with. The net result is easy pickings for critics - high risk for the policy proponent.

8. Conclusions and Evaluation

Performance intensity of aid has three core features.

In this paper analysis proceeded under the abstraction of three agents, a legislature that allocates resources to an aid budget and specifies the criterion against which the performance of the aid recipient is to be measured, an aid donor agency that sets the intensity of the performance target, and an aid recipient (country) that chooses the optimal level of performance in the allocative measure chosen by the aid donor.

Considerable slippage is introduced into the process of aid delivery. The model incorporated five distinct sources of slippage in policy delivery. First, the performance measure of interest to the aid donor is observed with measurement error. Second, the efficiency of the aid donor is also subject to both positive and negative shocks. Third, the recipient country may be subject to corruption in the aid transmission process. Fourth own effort of the aid recipient may be more or less efficient. Finally, adjusting the optimal level of optimal effort and by extension governance in the aid recipient is subject to adjustment costs.

Our simple model has demonstrated that performance intensity of aid generates incentive effects, such that the optimal level of effort and governance in the aid recipient will increase under strengthening performance intensity of aid. In addition, improving effort and governance in the aid recipient in turn was shown to lead to increased budgetary allocations to aid in the legislature that allocates aid resources. Performance intensity of aid thus has fundraising effects.

While performance intensity of aid under imperfectly observed effort also increases measurement noise, the incentive to increase true effort is likely to be stronger than that to increase noise in the governance measure. Moreover, the incentive to increase measurement noise is weakest for the poorest countries, and provided that the donor agency is sufficiently efficient, measurement error itself will serve to raise optimal

effort in the aid recipient. While monitoring noise in the governance measure of the aid recipient may be important for the aid donor, self-monitoring thus also carries important benefits.

Equally, however, it is useful to bear in mind the caveats that the model has identified, especially since they emerge under maximally favourable conditions to the policy intervention: aligned incentives between aid donor and aid recipient.

First, the effectiveness of the performance intensity of aid appears to depend strongly on the degree of efficiency of own effort in the aid recipient country.

This finding leads us to a first conjecture concerning the use of performance measures in policy: performance intensity of aid maximizes its impact under conditions where it is supplemented by technical assistance to improve the effectiveness of own effort by the aid recipient.

Second, despite its emphasis on circumstances that have *eliminated* any misalignment of incentives between aid donors and recipients, the model suggests that aid donors are likely to rely on performance intensity of aid precisely where such a reliance is least successful. In doing so, they are responding to their benevolent objective of improving the lot of the aid recipient - when things get worse in the aid recipient, the donor attempts to compensate by a more aggressive aid dispensation. This is true with respect to aid recipient costs, corruption, productive capacity, and the donor agency's own efficiency.

These results lead us to a second conjecture concerning the use of performance measures in policy: since the benevolent donor agency responds to negative shocks to the net income of aid recipient countries by increasing the performance intensity of aid, it may face considerable populist pressures at home. The left will abuse it for castigating the poor. The right for throwing good money at lost causes. Yet the intervention is simply a technically optimal attempt to improve the net welfare of the aid recipient. It is neither punishment, nor waste.

Finally, a consideration of the dynamics of adjustment in effort and by inference governance, identified a further source for concern in implementing performance measures in policy. The presence of adjustment costs in effort (hence governance) for the aid recipient introduces the possibility of optimal time paths in effort that are non-monotone. The implication is that effort, on the optimal time path of adjustment to a new higher level of effort, may be such as to initially make things worse before they improve.

Our third and final conjecture concerning the use of performance measures in policy is therefore that policy makers face risks in their implementation. The problem for the policy maker is that it may appear as if the policy is failing, immediately after implementation. Policy designed to improve effort and governance does produce change - but in the wrong direction. Even though things are bound to improve, and improve substantially, this may be both difficult to sell, and perhaps even more importantly difficult to distinguish from cases where things really *are* going wrong. The bottom line: easy pickings for critics - high risk for the policy proponent.

What remains is that performance intensity of aid works. It simply is no panacea.

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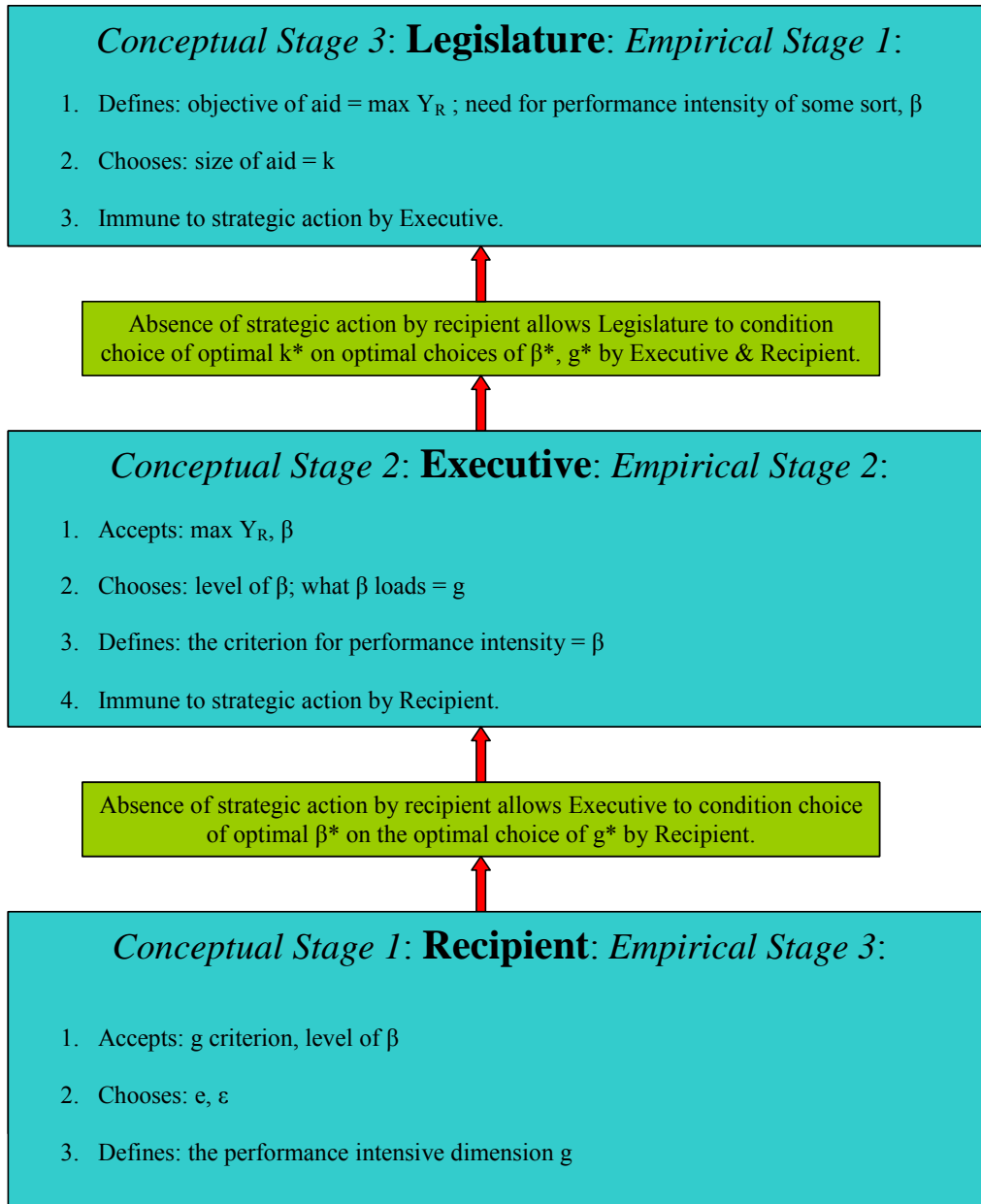


Figure 1: The Conceptual Structure of the Problem

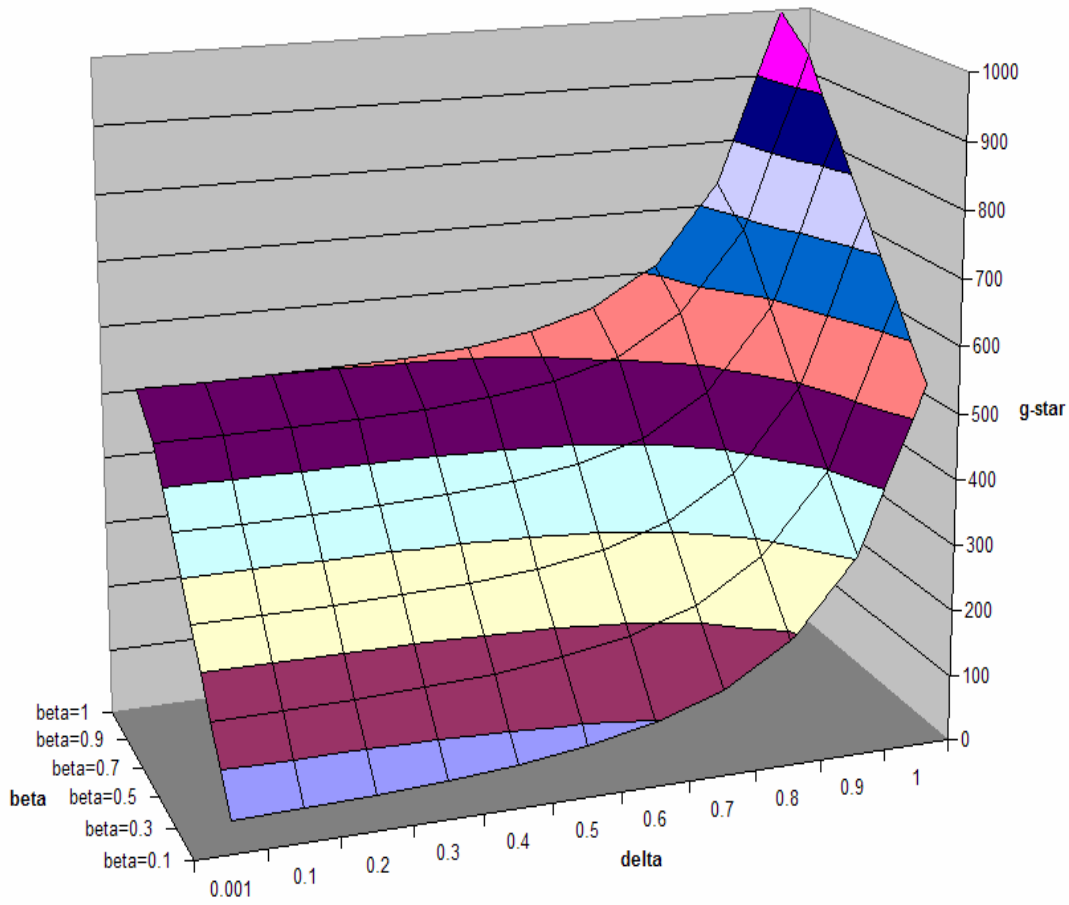


Figure 2: Variation of g^* in δ , over alternate β -parameterizations. $\theta = 1$, $\lambda = 0.001$, $\alpha = 1$, $\phi = 1$, $K = 1$, $E(\varepsilon) = 1$, $E(\mu) = 0$.

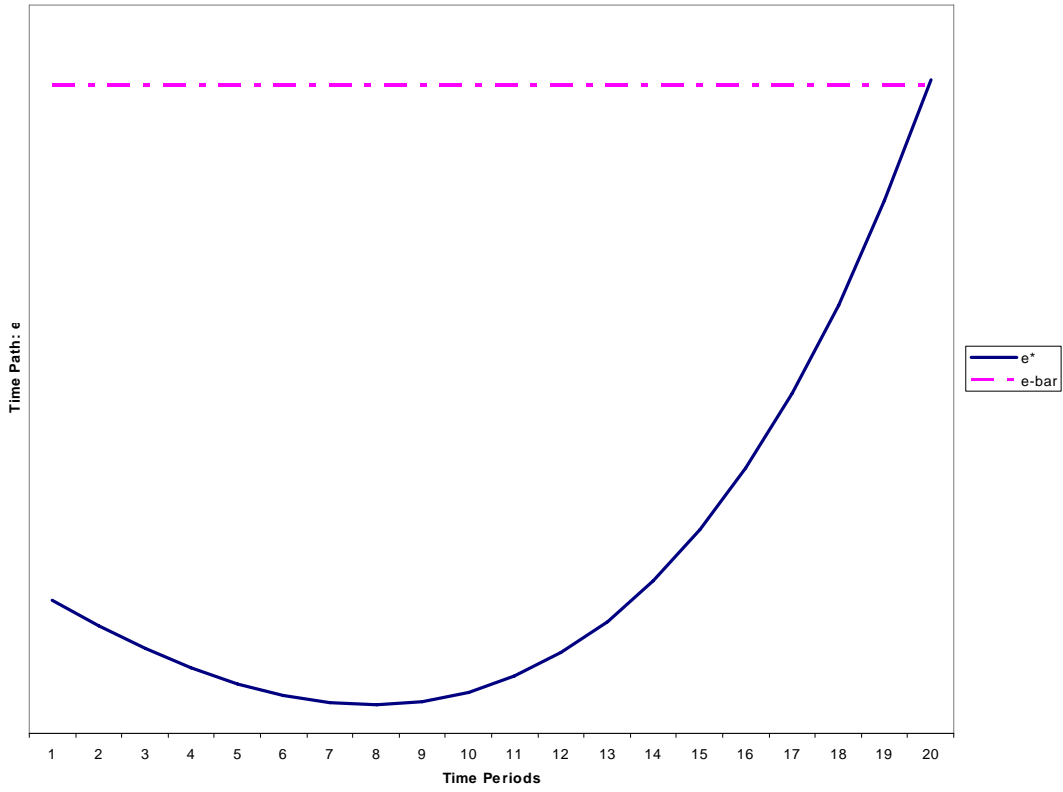


Figure 3: Illustration of optimal non-monotone adjustment in effort: $\alpha = 1, \beta = 1, \theta = 1.5, \epsilon = 0, \varepsilon = 1, \lambda = 0.001, \delta = 0.001, \phi = 1, \rho = 0.1, \varphi = 1, \zeta = 0.9$.

δ	$\beta = 0.1$	$\beta = 0.3$	$\beta = 0.5$	$\beta = 0.7$	$\beta = 0.9$	$\beta = 1$	$\frac{g_{\max}^*}{g_{\min}^*}$
1	549.901	649.901	749.901	849.901	949.901	999.901	1.82
0.9	304.001	397.301	492.101	587.801	684.201	732.601	2.41
0.8	190.001	279.601	372.401	467.001	562.701	610.801	3.21
0.7	131.001	219.401	312.401	407.601	504.101	552.601	4.22
0.6	97.901	187.001	281.401	377.901	475.401	524.501	5.36
0.5	78.201	169.201	265.301	363.101	461.601	511.001	6.53
0.4	66.101	159.501	257.101	355.801	455.001	504.701	7.64
0.3	58.601	154.401	253.101	352.401	452.001	501.901	8.56
0.2	54.101	151.701	251.201	350.901	450.701	500.601	9.25
0.1	51.401	150.501	250.301	350.201	450.201	500.101	9.73
0.001	50.001	150.001	250.001	350.001	450.001	500.001	10.00
$\frac{g_{\max}^*}{g_{\min}^*}$	11.00	4.33	3.00	2.43	2.11	2.00	

Table 1: Optimal governance under alternative effort effectiveness (δ) and aid incentive (β) parameterizations. Scaling is arbitrary.