

**The Provision of Social Services in Fragile States:
Independent Service Authorities as a New Modality**

Tessa Bold, Paul Collier and Andrew Zeitlin

Centre for the Study of African Economies
University of Oxford

May 2009

1. Problems of service delivery in fragile states

Over the past two decades aid agencies have radically altered their approach to aid delivery. Aid allocations are now largely based on attained policy performance rather than on promises of policy change, and delivery modalities have shifted from projects to budget support. In countries where economic governance and government capacity are already reasonably strong these changes are probably a substantial improvement on past practices. However, they are less well-suited at the other end of the spectrum of governance and capacity, now commonly referred to as ‘fragile states’. These countries have the most acute needs, yet because of concerns about their ability to use aid effectively they do not receive allocations that are commensurate. Indeed, while paying lip-service to the principle of country ownership, in practice in fragile states donors channel much of their aid for basic services directly to NGOs. While this recognizes that the state has failed as an effective delivery mechanism for basic services, it places excessive reliance upon the intrinsic competence of NGOs. Donor support for NGOs is usually not backed by adequate evaluation of their performance: they are, in effect, unaccountable.

In essence, the current problem for aid agencies is that two objectives, helping those most in need and ensuring that aid is well-used, are being targeted with a single instrument, aid allocation. As Tinbergen showed, so structured the two objectives cannot both be achieved: the policy decision reduces to an inherently unsatisfactory trade-off between them. What is needed is a second instrument. If distinctive modalities for aid delivery could be developed that work well in fragile states, aid allocation could be based on need, with effective use being addressed by choice of modality. This paper proposes a new modality by which donors could provide aid for basic services in fragile states: an Independent Service Authority (ISA).

The structure of the paper is as follows. Section 2 introduces the concept of an Independent Service Authority, explaining its strengths and limitations, and the contexts in which it is likely to be appropriate. It is not intended to be a general model for service provision, but rather one that is tailored to the distinctive needs of fragile states. Section 3 is a technical section which sets out an integrated framework which

can characterize the various challenges posed by service delivery in fragile states. It applies principal-agent theory, which is the standard tool which economics uses to analyze problems of agency. Section 4 then applies this analytic framework to the chain of agency problems implied by an ISA. The first link in the chain is between the organizations with which the ISA contracts and their own employees: why should they be able to get better performance from frontline staff than can the line ministries? The second link in the chain is between the ISA and the organizations which it contracts to provide services: what incentives can the ISA provide to these organizations that induces them to perform to the level of their capabilities? The third link in the chain is between the ISA and its own employees: why might they be expected to work more effectively than current employees of the line ministries? Between them, these three links establish that in the context of a fragile state an ISA is likely to be more capable of providing basic services than are the line ministries. The final link in the chain is between the ISA and the government: given that an ISA has the capacity to deliver this improved performance, why might the management of an ISA actually choose to do so? Section 5 summarizes the situations in which an ISA is likely to be a significant improvement on current modes of service provision, and discusses possible transitional arrangements for its introduction.

2. Independent Service Authorities, introduced

An Independent Service Authority (ISA) is a public agency outside the civil service, somewhat analogous to an Independent Revenue Authority and a central bank. It is an implementing agency for government policy in the delivery of basic services.

To date, in fragile states the role of government in basic service delivery has been modelled on the European state of the 1950s: the structures typically inherited at Independence. Ministries of Education, Health, and Public Works, formulate policy, allocate resources to primary delivery units, and also manage those units. However, because this model of provision has proved to be severely inadequate, the actual on-the-ground delivery of basic services is often largely performed by a wide array of non-government providers, such as churches, secular NGOs, local communities and private firms. These providers operate in parallel with government provision, but, although many of them are funded by donors, they are wholly disconnected from it.

In principle, the three functions of the traditional ministry can be separated. Policy formulation is necessarily a function of government ministries. On-the-ground service provision could continue to be done by many different types of organization, but instead of being detached from public provision, they could be funded publicly. In between the ministries formulating policy, and the multitude of service providers, an ISA would allocate public funds to these providers in such a way as to achieve objectives set by the ministries, but imposing yardstick competition on recipients. The ISA would receive public funding from donors and government: this would feature in the national budget as a component of public spending. In turn, the ISA would enter into contracts with service providers, channelling funds to them. The core function of the ISA would be to monitor the relative performance of these service providers on the criteria of cost-effectiveness and quality, recognizing that these are only imperfectly observable. The ISA would be managed by a board: as a public agency a majority of this board would be appointed by government, but it would also initially include both donors and local civil society.

An ISA is not appropriate everywhere: as discussed below it is not the ‘first-best’ design of basic service delivery. Rather, it may be the best feasible design in contexts which are particularly difficult. The most appropriate contexts are where needs are acute yet public service provision has largely broken down. For example, in Haiti only around a tenth of basic services are provided directly by ministries, most are provided by NGOs, churches or the private sector. In several countries of sub-Saharan Africa most citizens rely for primary health care predominantly upon non-government sources. Liberia, the Democratic Republic of the Congo, Afghanistan, Sierra Leone, and Somalia, are all contexts in which an ISA is likely to be an improvement on present systems. Indeed, quite often in these contexts *ad hoc* variations such as GEMAP in Liberia, and Social Funds, have been introduced by donors as responses to a reality in which the standard approach of budget support and government ownership would be irresponsible. Yet these *ad hoc* measures are manifestly unsatisfactory. GEMAP places the donors at the heart of government decision taking: it is radically more intrusive than an ISA. Social Funds cannot usually finance recurrent costs of basic services: they are structured only to pay for capital costs of ‘projects’ with the running of organizations then handed to ‘communities’. Yet the fragile states in which donors resort to Social Funds are precisely the contexts in which there is most need

for recurrent costs to be met by donors or government: communities are impoverished and often fractured by conflict. Donors have thus developed the architecture of budget support to finance recurrent costs in well-governed states, but have as yet no corresponding architecture for recurrent costs in the states where it is most needed.

Since the need for basic service provision in fragile states is acute, the ability rapidly to meet it should be the primary objective of service provision. Improvements in service provision cannot reasonably be subordinated to ideological notions of the functions which a state should perform. An ISA is an approach which starts from this recognition: new administrative architecture is likely to be necessary for rapid improvement in service provision. However, an ISA need not be a temporary solution to the problem of service provision. It may be that the conditions under which the public service ethos on which a traditional, European-style, well-functioning state depends can only be built in atypical circumstances. For example, the public service ethos of 1950s Britain had been forged in the preceding Second World War. The ethos long prevalent in Scandinavia may have depended upon an unusually strong egalitarianism arising from a prolonged period of high taxation in small and ethnically homogenous societies. Sacrificing the second-best solution provided by an ISA in fragile states for an unattainable objective, is liable to yield the third best: a public sector that is neither self-motivated nor motivated by incentives.

Even within the context of fragile states there is much scope for variation in the details of ISA design. While the type of ISA discussed in this paper would be a single, national organization responsible for a wide variety of basic services, the concept is sufficiently flexible to permit several variants. Instead of being a national organization it could instead be decentralized as a set of local organizations. Instead of spanning all service provision there could be a distinct organization for each type of service. These alternative designs are not discussed in this paper but may be appropriate in some contexts.

Pros and Cons

An ISA is only appropriate in the context of fragile states: in the context of a well-functioning state its disadvantages probably outweigh its advantages. Where feasible, the best approach is likely to be to combine the three functions of planning, resource

allocation and on-the-ground service delivery in government ministries. The issue turns on the motivation of public sector employees.

The core function of an ISA is to link decisions of resource allocation to the monitored performance of organizations that provide social services. However, since performance of these organizations can only be imperfectly observed, an ISA will inevitably get some of these decisions wrong. It is therefore inferior to provision by a public service staffed by people who are sufficiently strongly self-motivated to serve the public interest that their performance can therefore be left unmonitored.

While the average motivation of staff within a civil service differs enormously between states, both high average motivation and low average motivation can be persistent. Typically, new recruits to an organization internalize the prevailing norms of existing staff. Hence, where the dominant ethos of public service staff is to be public-spirited the norm can readily be perpetuated. However, for the same reason, where such an ethos either never existed or has long been lost, it is extremely difficult to build it incrementally: new staff adopt the norms of existing staff. An ISA may be appropriate where the dominant ethos within public service provision is self-interest. Typically, in fragile states this is unfortunately the case. The public service ethos might well have been eroded by pay levels that are unrealistically low. However, the cause of a problem need bear little logical connection to its appropriate solution. Once the public service ethos is lost, raising pay levels is unlikely to be sufficient to restore it. Instead, badly paid self-interest may be replaced simply by better-paid self-interest.

In fragile states it is an urgent matter to achieve substantial improvements in social provision. Realistically, the public service ethos in government ministries cannot be restored over a pertinent time frame. Although the lack of staff motivation in fragile states is dysfunctional, it is nevertheless likely to be a stable local equilibrium: actual behaviour is the most advantageous for the individual conditional upon the behaviour of others. Behaviour is set by norms and so the expectation is that behaviour today will be like behaviour yesterday. Initiatives may be able temporarily marginally to improve standards as people expect the behaviour of others to be better. However, it is very difficult for interconnected behaviour to 'shuffle' from a stable equilibrium all the way to a new and better one. In the neighbourhood of the initial equilibrium there are powerful forces propelling behaviour back to it. Thus, a more likely outcome is

that as the initiative fizzles out the initial equilibrium is restored. This is, perhaps, why despite almost continuous civil service reform and strengthening efforts by donors for several decades, in fragile states the civil service is still usually highly dysfunctional.

If restoring an ethos of public service is not realistic, what are the alternatives? One approach is to monitor the behaviour of civil servants and provide them with financial incentives. Staff may remain self-interested yet perform better because they face incentives which induce them to deliver monitored objectives. A second approach is for donors, who in fragile states provide most of the money for service provision, to by-pass the state and directly fund NGOs. An ISA is a third approach in which public money is used to finance independent service-providing organizations, which receive their funding from a new public agency that bases its decisions on monitored performance. An ISA is likely to be superior to both of these other alternatives.

An ISA is superior to incentivizing the civil service

First, given civil service employment contracts and practices it not realistic to introduce significant penalties for poor performance: incentives can only take the form of rewards for good performance. In contrast, an ISA can credibly threaten reductions in funding of badly performing organizations, even if these lead to loss of employment in these organizations since the state is not the employer. In the context of service provision, this greater freedom to use the penalty of dismissal may be better-suited to inducing satisfactory employee performance. For example, in the Cambodian experiment in the contractual provision of social services discussed below, contractors could have chosen to pay rewards linked to observed performance, but most preferred to set a higher basic wage combined with a credible threat of dismissal.

Second, the ISA can be entirely agnostic as to how employees of service providing organizations are most effectively remunerated. It judges only the overall performance of the organization. This flexibility can be helpful because, as we discuss, there is no simple, ‘one-size-fits-all’ solution to overcoming the problem of low intrinsic motivation. Because in service provision performance of individual employees cannot be well-observed, there is likely to be a trade-off between reliance upon high-powered incentives tied to observed outcomes and the degree of

internalized commitment to the goals of the organization. High-powered incentives tend to create inequalities between staff and to attract the greedy: both make it more difficult to build a common commitment to organizational goals. Some service-providing organizations may well be able to combine low-powered incentives with a strong sense of personal commitment in its employees, for example based on religious commitment, pride in the organization, or the internalization of professional standards (Akerlof and Kranton [1]), and these are likely to be highly efficient. Such islands of high ethical standards may be able to expand rapidly without jeopardizing commitment as new recruits absorb the norms of existing staff, even though it is not feasible incrementally to improve ethical standards within the civil service. That is, *it is easier to raise ethical standards by moving people from low-motivation organizations to high-motivation organizations, than to raise the standards of low-motivation organizations.*

Third, by creating yardstick competition between organizations, the ISA can raise the average standard. The most obvious way in which this is can come about is through motivating each organization to improve. However, this need not be the most important way. Even if performance of each organization is unaltered, the average standard of service delivery can be raised through reallocating funding towards the more efficient performers.

An ISA is superior to free-range NGOs

The approach that is in practice relied upon by donors in fragile states is not to incentivize the civil service, but rather to bypass it both through the use of NGOs and the Global Funds. These bypasses have major drawbacks.

First, in funding social provision the standard problem is to match resources to needs. For example, geographic coverage of provision should be equitable. To achieve satisfactory allocation requires public control because social needs cannot adequately be met by market mechanisms. In the free-range NGO system there is no centralized allocation of resources. There are typically several donors, each funding its own NGOs. Since these operations bypass the state no organization has the capacity, or the authority, to coordinate provision.

Second, it leaves NGOs as largely unaccountable: donors simply do not have the systems in place to monitor local performance of service delivery. This lack of accountability is liable to feed back onto NGO performance and also traps donors into a system in which they never build the evidence of success necessary to justify financial scaling up. Because there is little possibility of scaling up, NGOs often settle for boutique operations, rather than learn how to build systems capable of mass provision.

Third, by bypassing the state, NGO provision fundamentally detracts from the ability of the state to gain credibility and authority with citizens. They look to NGOs rather than to the government for basic services and so, expecting nothing from the state, demand nothing from it. Thus, not only are NGOs unaccountable, so is the government.

Fourth, the Global Funds approach tends to be disease-specific rather than sector-wide and so faces coordination problems across services within the sector.

In contrast, an ISA addresses all of these weaknesses. It holds NGO service providers to account. It allocates resources according to guidelines set by the ministries that can cover such matters as equitable spatial distribution of services. It provides public finance for NGO activities and, in return, can demand that services be co-branded as jointly provided by the NGO and the government. It can take an integrated view of different services.

Finally, while the total bypass can never be more than a stop-gap measure, postponing a viable longer term solution, publicly funded provision of service delivery by multiple organizations can be appropriate in the long term as well as the short, and builds organizational capacity within the public sector.

3. Five challenges in service delivery, and solutions in ISA design

We will characterize the optimal delivery of public services in a principal-agent framework. Essentially, the principal-agent framework aims to model how a policy maker (the principal) can induce a service provider (the agent) to deliver high quality services under two assumptions:

1. The policy maker's preferences for the service are stronger than the provider's (divergent tastes).
2. The provider's efforts in delivering the service are only imperfectly controlled and observed by the policy maker (asymmetric information).

To give a simple example of how the principal-agent problem naturally arises in service delivery, consider the health sector. The Ministry of Health of country X would like quality health services to be delivered throughout the country. In order to do this, Ministry officials recruit doctors to work in hospitals. If doctors care as much about quality health-care delivery as the Ministry of Health/society, then quality service delivery is straightforward, and in a sense this is the ideal scenario. However, this may not necessarily be the case, that is, unless the government finds some other way of motivating doctors, tastes for quality health-care diverge between the government/society and the service provider. This can manifest itself via two avenues. For example, a particular recruit may have chosen to take up medicine because it's a well-paid and secure job and because there are ample opportunities for private enrichment in the public service, while another recruit may see medicine as their chosen profession and be intrinsically motivated to help sick people. Without some prior information about an applicant's character, the Ministry of Health may find it difficult to distinguish between those two types of doctors. Moreover, depending on the salary offered, it may even end up attracting the wrong sort of medic to work in the hospital (this is known as adverse selection or hidden information problem). Secondly, once a doctor is hired and posted in a hospital, it may be difficult for the Ministry of Health to observe and therefore control how much effort the doctor puts into his work. Of course, the Ministry is hopefully able to observe patient's health after they've been treated, however, this observable outcome is most likely only an imperfect measure of the doctor's effort, because many other uncertain factors that are outside his/her control will impact on a patient's recovery after treatment. Because of these associated risks, doctors customarily do not bear the full risk of treating a patient on their own.¹ However, because of this, doctors may actually take less care

¹ Given the risks involved, it might be difficult to attract anyone into the medical profession if that were not the case.

when treating patients, thereby reducing the likelihood of the patient being cured (this is known as moral hazard or hidden action problem).

We will demonstrate in the following that appropriate contract design can go at least some way towards overcoming these problems of hidden information and actions. Having said that, flexible contractual design will in general not achieve first-best outcomes unless the preferences of society and the service provider are perfectly aligned – that is, unless service providers are intrinsically motivated to deliver quality services. Creating intrinsic motivation is a difficult task and an Independent Service Authority is no better placed than any other organization to generate it among its employees and partners. To put it bluntly, an Independent Service Authority cannot create intrinsic motivation where it does not exist. Instead, the main innovation of the ISA is, that it has several methods available to motivate service providers – taking their preferences as given – through monetary means, competition, and offering a menu of contracts to provide services at least cost.² In particular, the ISA has the option to use the following mechanisms to motivate service providers to deliver quality services.

1. Screen workers by offering differential contracts which enables them to elicit better performance from differentially motivated workers at lower cost.
 - Offer a menu of contracts in order to attract motivated workers and have least-cost wage bill
2. Offer performance pay to incentivize good performance.
 - Explicit incentives make remuneration and continuation of contract conditional on performance in delivering services
 - Implicit and dynamic incentives: future promotion conditional on current good performance.
3. Create a market place for service delivery
 - This allows for better performance by creating yard-stick competition among different providers.

² As we will see, this may have the indirect consequence that service providers who are already intrinsically motivated expand, while less effective ones disappear out of the market.

- This allows for better performance by matching heterogeneous workers and organizations whose missions and motivations are most closely aligned.
4. Decentralizes service delivery
 - This allows for better performance by taking account of local preferences and information.
 5. Allows moving to a higher welfare equilibrium (non-marginal change from
 - Need for non-marginal change (not piecemeal) change in composition of service delivery agency to move from an entrenched equilibrium of 'low motivation/high corruption' to a better equilibrium of 'high motivation/low corruption'.

3.1. Screen workers by offering differential contracts which enables them to elicit better performance from differentially motivated workers at lower cost.

The difficulties faced by the Ministry of Health in recruiting and paying doctors outlined in the previous section can be formalized in a principal-agent model of service delivery. The principal faces a hidden information problem when recruiting doctors because the recruits have private information about their ability and motivation to deliver health care which is not known to the Ministry of Health (adverse selection). Once the Ministry of Health has recruited a particular doctor, it is difficult for the Ministry of Health to observe how much effort the doctor puts into his/her job (moral hazard). We will consider each of these issues in turn beginning with the problem of how to deliver quality services when employees have hidden information about their ability. As we will see, to overcome this problem, it is crucial that the employer is able to offer a menu of different employment contracts which vary in terms of required performance and wages.

To see this, consider a simple screening model.³ Suppose the principal P , denoting a benevolent government or Independent Service Authority wants to provide a quantity q of a service and employs the agent A , denoting the service provider, to deliver this. The agent may be more or less able or motivated, which is measured by the parameter $\theta = \{\theta_L, \theta_H\}$ and this affects the cost of producing q , which is given by $\frac{c}{\theta_i} q$ for $i=L,H$. The proportion of agent's of high and low ability is β and $1 - \beta$ respectively. The principal's problem is to offer a menu of contracts $\{q_i, w_i\}$ to an agent of type $i=L,H$, where q_i is the quantity of the service produced and w_i is the salary paid for delivering the service. We assume that the principal is risk-neutral and the agent is risk-averse, meaning that he would prefer receiving USD 1 for sure to taking a gamble of receiving either USD 2 or nothing with equal probability. Hence, the principal's payoff from contracting with the agent can be written as follows $V(P) = \beta(q_L - w_L) + (1 - \beta)(q_H - w_H)$ and the agent's payoff is $U(A_i) = u(w_i) - cq_i$, where $u' > 0$ and $u'' < 0$, meaning that the agent's utility function is concave and there are diminishing marginal returns to consumption. Finally, assume that the agent receives a payoff of \bar{u} if he does not accept any of the contracts offered by the principal.

To focus ideas, we first review the first-best solution to this contracting problem when the agent's ability is observable to the Ministry of Education either because of superior information or because the agent is intrinsically motivated to reveal his true ability. The principal can then treat each agent separately and offer an optimal type-specific contract, which is found by solving the following problem

$$\max_{q_i, w_i} q_i - w_i$$

subject to the agent's participation constraint:

$$u(w_i) - \frac{c}{\theta_i} q_i \geq \bar{u}.$$

³ The exposition here closely follows Bolton and Dewatripont [7], pp.48-56.

The solution to this problem is given by:

$$\theta_i u'(\tilde{w}_i) = c$$

and

$$u(\tilde{w}_i) - \frac{c}{\theta_i} \tilde{q}_i = \bar{u}.$$

From the concavity of the utility function it follows that it is efficient to offer a contract with both higher output and higher wages to the high ability agent and a contract with lower output and lower wages to the low ability agent. This will maximize the net benefit of delivering the service (or alternatively deliver a given level of the service at minimal cost)

$$V(P) = \beta(q_L - w_L) + (1 - \beta)(q_H - w_H)$$

The optimal contract maximizes social benefits and is implemented by specifying the quantity of the service the agent should produce at unit cost $\frac{c}{\theta_i}$ while the type-specific wage ensures that the participation constraint of each agent is satisfied. How the total surplus is shared depends on the outside opportunity of each agent. To put it another way, under first-best, the total surplus is determined independently of the way in which it is shared. Hence, under first-best, we can achieve both efficiency and equity. As we will see this is no longer the case in the presence of hidden information.

Let us now consider the second-best scenario in which the agent's ability is unobserved. In addition to maximizing surplus and satisfying the participation constraints, the menu of contracts must now be designed in such a way that each agent finds it in his interest to truthfully reveal his ability by choosing the contract that is designate for his particular ability level. Hence, the principal's problem now becomes

$$\max_{q_i, w_i} \beta(q_L - w_L) + (1 - \beta)(q_H - w_H)$$

subject to the agent's participation constraint:

$$u(w_i) - \frac{c}{\theta_i} q_i \geq \bar{u} \quad \forall i = L, H$$

and the individual rationality constraints

$$u(w_H) - \frac{c}{\theta_H} q_H \geq u(w_L) - \frac{c}{\theta_H} q_L$$

$$u(w_L) - \frac{c}{\theta_L} q_L \geq u(w_H) - \frac{c}{\theta_L} q_H$$

which state that a high ability agent should prefer her own contract to that of a low ability agent and vice versa. Understanding which of these constraints will bind gets to the heart of how hidden information affects optimal service delivery. Consider the first-best allocations derived previously. Both agents receive a surplus equal to their outside opportunity \bar{u} . The high ability agent's wage is determined by $u(w_H) = \frac{c}{\theta_H} q_H + \bar{u}$ and the low ability agent's wage is determined by $u(w_L) = \frac{c}{\theta_L} q_L + \bar{u}$. This is not incentive-compatible, however, because the high ability type would find it in his interest to choose the contract $\{q_L, w_L\}$ designated for the low ability agent. His own contract earns him a surplus of \bar{u} , while the other contract earns him a surplus of $u(w_L) - \frac{c}{\theta_H} q_L = \frac{c}{\theta_L} q_L - \frac{c}{\theta_H} q_L + \bar{u} > \bar{u}$. In contrast, the low ability agent would earn a smaller surplus than \bar{u} if he selects the contract designated for the high ability agent. Therefore, in order to make the contract incentive compatible, it is necessary to make the low ability contract less attractive to the high ability agent by increasing the surplus he receives from his own contract relative to first-best.

The first-order optimality conditions for the hidden information problem reflect this and are given by

$$u'(w_H) = \frac{c}{\theta_H}$$

and

$$u'(w_L) = \frac{c}{\theta_L} \frac{1}{1 - \left(\frac{1-\beta}{\beta} \frac{\theta_H - \theta_L}{\theta_L} \right)} > \frac{c}{\theta_L} \Leftrightarrow w_L^{FB} > w_L^{SB}$$

Moreover, the low ability agent's surplus is again \bar{u} , which is just the payoff he would receive if he didn't enter the contract, while the high ability agent receives a

higher surplus, $\frac{c}{\theta_L}q_L - \frac{c}{\theta_H}q_L + \bar{u}$, from choosing the contract designated for him, which is of course precisely the surplus he would obtain by mimicking the low ability agent. This is the “informational” rent that the principal needs to transfer to the high ability agent in order to make him truthfully reveal his ability. Since the high ability agent will earn a higher wage because he can produce bigger quantities of the service at lower cost, the principal can reduce the high ability agent’s incentive to mimic the low ability agent by lowering w_L (and therefore q_L) relative to what would have been paid under first-best. This lowers the informational rent of the high ability type, but also reduces the total surplus available to society. The wage w_H of the high ability agent is the same as under first-best. This makes sense, because the low ability agent has no incentive to mimic the high ability agent and so it’s not necessary to distort the high ability agent’s wage. Note that both under first-best and second-best, optimality requires that the principal offers a menu of contracts consisting of type-specific outputs and wages from which the agents can choose. That is, agents will be treated heterogeneously in equilibrium (even though in a first-best world they both earn the same surplus if their outside option is the same). Moreover, the extent of wage inequality in the second-best contract $w_H^{SB} - w_L^{SB}$ exceeds the extent of wage inequality in the first-best contract $w_H^{FB} - w_L^{FB}$ and the high ability agent earns a larger surplus than the low ability agent.

To summarize:

1. The second-best optimal wage for the high ability type is the same as the first-best optimal wage, but the low ability type receives a lower wage.
2. The low ability type obtains a surplus of \bar{u} equal to his outside option, while the other type obtains a positive “informational” rent.

These two conclusions continue to apply in more complex situations where the principal is faced with a potentially infinite number of different types.

The difference between first-best and second-best is illustrated in Figure 1, which plots the percentage of the first-best total surplus that is achieved by the second-best contract as a function of the ability to offer differential contracts measured by $u(w_H) - u(w_L)$. The problem is parameterized as follows: $\theta = \{0.8, 1.2\}$, $c = 0.5$,

$u(x) = \frac{1}{1-\rho} x^{1/(1-\rho)}$, where ρ measures how risk-averse an agent is. We calculate the first and second-best contract for two levels of risk-aversion $\rho = \{0.1, 0.2\}$ in order to explore how risk-aversion and uncertainty affect the second-best contract. The percentage of first-best welfare is measured as

$$\frac{V^{SB}(P, u(w_H) - u(w_L)) - V^{SB}(P, u(w_H^{FB}) - u(w_L^{FB}))}{V^{FB}(P, u(w_H^{FB}) - u(w_L^{FB})) - V^{SB}(P, u(w_H^{FB}) - u(w_L^{FB}))} \times 100$$

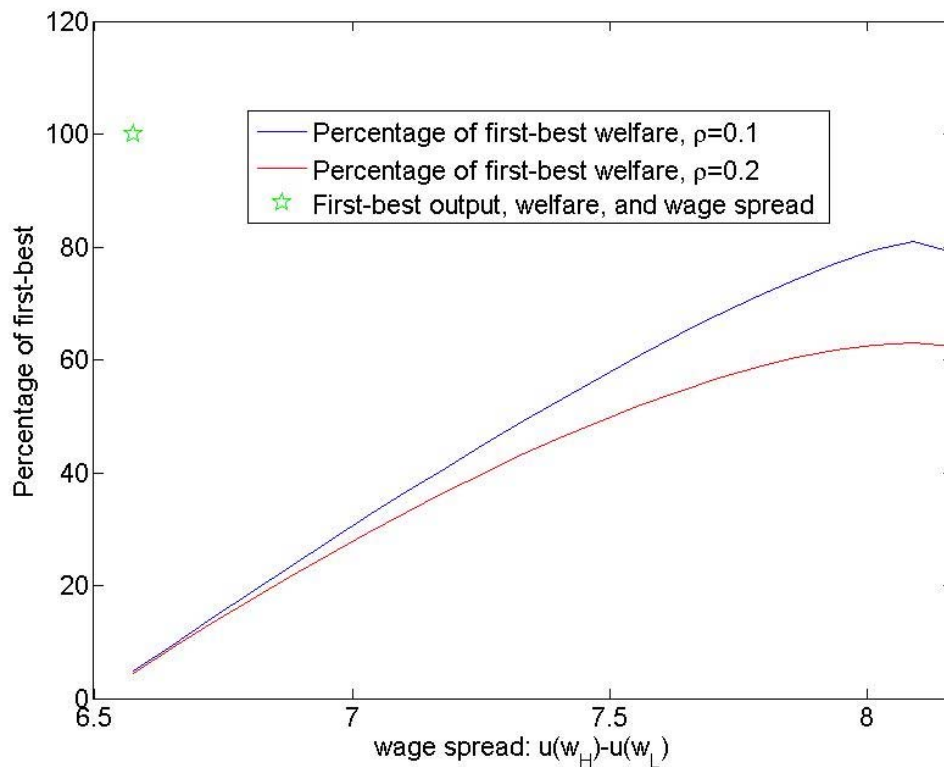


Figure 1: Comparing first-best and second-best in a hidden action problem

The first thing to note in Figure 1 is that a second-best contract can get us a long way towards first-best without ever quite achieving it. The shortfall is more pronounced the more risk-averse the agent is because with diminishing returns to consumption it becomes ever more costly to reduce the informational rent of the high ability agent. When $\rho = 0.1$, a well-designed menu of contracts can get us 80% of the way to first-best. When $\rho = 0.2$, this percentage drops to 60%. As already hinted at, the optimal wage spread under second-best is larger than under first-best, because the high ability

agent needs to be dissuaded from choosing the low ability contract. Under first-best, total surplus is maximized for a wage spread of 6.6, the highest surplus under second-best is obtained by moving all the way up the spectrum and using a wage spread of 8. To see what happens in a second-best world if wages cannot be differentiated as much as is necessary to get the constrained optimal result, we also calculate the second-best contract for all values of $u(w_H) - u(w_L)$ such that $u(w_H^{FB}) - u(w_L^{FB}) \leq u(w_H) - u(w_L) \leq u(w_H^{SB}) - u(w_L^{SB})$. It can be clearly seen that moving from the second-best wage spread to the first-best wage spread, which involves more equal treatment of agents in terms of wages, makes us worse off in a second-best world. This is generally true: using first-best policies in a second-best world leads to third-best outcomes. This analysis directly applies to service delivery in a second-best world. Policy makers will often be unwilling or unable to offer employees differential contracts. While this lack of differentiation may at least to some extent be appropriate in a first-best world, it reduces social surplus even further in a second-best world with asymmetric information.

3.2. Performance Pay

Let us now consider the hidden action problem that arises once the principal has recruited an agent of a given type. Again, the principal \mathbf{P} wants to provide wants to provide a quantity \mathbf{q} of a service and employs the agent \mathbf{A} , to deliver it. The quantity of the service \mathbf{q} the agent can deliver is a function of the effort \mathbf{a} she exerts, but also of other random environmental factors, $\boldsymbol{\varepsilon}$, neither of which the principal can observe. Hence, $\mathbf{q} \in [\underline{\mathbf{q}}, \bar{\mathbf{q}}]$ is a random variable with distribution function $\mathbf{F}(\mathbf{q}|\mathbf{a})$ and exerting more effort \mathbf{a} increases the probability of a high output \mathbf{q} .⁴ Exerting effort incurs a unit cost of \mathbf{c} . The principal's problem is to choose the optimal amount effort from society's point of view, \mathbf{a} , and to offer a wage schedule, \mathbf{w} , which may depend on observed output \mathbf{q} , to the agent that will induce him to exert the constrained-optimal

⁴ $\mathbf{F}(\mathbf{q}|\mathbf{a})$ denotes the probability that conditional on having put in effort \mathbf{a} , the quantity of the service delivered is at least \mathbf{q} , that is $\mathbf{F}(\mathbf{q}|\mathbf{a}) = Prob(\hat{\mathbf{q}} < \mathbf{q} | \mathbf{a})$, which is assumed to be increasing in \mathbf{a} .

effort. The principal's payoff from contracting with the agent can be written as follows $V(P) = v(q - w)$ and the agent's payoff is $U(A) = u(w) - ca$. Finally, assume that the agent receives a payoff of \bar{u} if he does not accept any of the contracts offered by the principal. In what follows, we will assume that the quantity of the service delivered can only take on two values $q = \{q_L, q_H\}$ and the probability of delivering q_H is given by $\Pr(q = q_H | a) = p(a)$. Assume that $p' > 0$ and $p'' < 0$, so that there are diminishing returns to exerting effort. An alternative approach is to model output as being normally distributed conditional on effort and we will see later how this assumption can help us make more precise statements about the relationship between optimal incentive pay and environmental uncertainty. For ease of exposition, let us proceed with this simple two-performance outcome case and derive the main feature of optimal performance incentive contracts in an environment characterized by moral hazard: in a second-best world the principal elicits effort from the agent by making his compensation contingent on performance.⁵

As in the case of adverse selection, it is instructive to first review the first-best solution to this contracting problem when the agent's effort is observable and contractible. The optimal contract is then the solution to the following maximization problem

$$\max_{a, w_i} \pi = p(a)V(q_H - w_H) + (1 - p(a))V(q_L - w_L)$$

subject to the agent wanting to participate in the contract

$$p(a)u(w_H) + (1 - p(a))u(w_L) - ca \geq \bar{u}$$

This constrained maximization problem can be written as a Lagrangian, in which the constraint is added to the problem and multiplied by a positive constant known as the Lagrangian multiplier:

⁵ The analysis in this section closely follows Bolton and Dewatripont [7], pp. 130-139.

$$\begin{aligned} \max_{a, w_i} L = & p(a)V(q_H - w_H) + (1 - p(a))V(q_L - w_L) \\ & + \lambda[p(a)u(w_H) + (1 - p(a))u(w_L) - ca - \bar{u}] \end{aligned}$$

The first-order condition with respect to wages is given by

$$\frac{V'(q_H - w_H)}{u'(w_H)} = \lambda = \frac{V'(q_L - w_L)}{u'(w_L)}$$

This states that the ratio of marginal utility between the principal and agent is to be constant across output states. The extent of insurance that this entails depends on the relative degrees of risk-aversion of the principal and the agent. As above, suppose that the principal is risk-neutral and the agent is risk-averse. In this case, the above simplifies to

$$\frac{1}{u'(w_H)} = \lambda = \frac{1}{u'(w_L)} \Leftrightarrow \frac{u'(w_L)}{u'(w_H)} = \lambda$$

Since the agent is risk-averse with $u' > 0$, and $u'' < 0$, the above can only be true if her wage w^* is the same regardless of whether output is high or low. In other words, if the principal is risk-neutral then he bears all the risk and provides perfect insurance to the agent. The opposite is true if the agent is risk-neutral and the principal is risk-averse. If both the principal and the agent are risk-averse, then they will share the risk inherent in producing q .

The first order conditions with respect to effort a yield the following

$$\begin{aligned} p'(a) \left\{ [V(q_H - w_H) - V(q_L - w_L)] + \frac{V'(q_H - w_H)}{u'(w_H)} [u(w_H) - u(w_L)] \right\} \\ = \frac{V'(q_H - w_H)}{u'(w_H)} c \end{aligned}$$

This states that the net benefit from marginally increasing effort, which raises total surplus by $p'(a)[V(q_H - w_H) - V(q_L - w_L)]$, but raises society's wage bill by $\frac{V'(q_H - w_H)}{u'(w_H)} p'(a)[u(w_H) - u(w_L)]$ should be equal to the marginal cost of effort to society $\frac{V'(q_H - w_H)}{u'(w_H)} c$. Again, it is easier to appreciate this condition, when we make specific assumptions about the respective level of risk-aversion of the principal and

the agent. When the principal is risk-neutral and the agent is risk-averse, then the above simplifies to

$$p'(a)[q_H - q_L] = \frac{1}{u'(w^*)}c$$

When the agent is risk-neutral, then the condition becomes

$$p'(a)[q_H - q_L] = c$$

irrespective of the principal's attitude to risk. Quite generally, in a first-best world, there is no tension between the efficient service delivery and the desire for agents to be insured against risk, because the principal can just stipulate that first-best effort is provided without having to incentivize the agent. As we will see, this is in general no longer the case when effort is unobservable.

Let us now consider an such an environment. The principal's problem is now to choose a compensation contract such that the agent finds it in his own interest to supply the optimal effort. The optimal contract is the solution to the following maximization problem

$$\max_{a, w_i} \pi = p(a)V(q_H - w_H) + (1 - p(a))V(q_L - w_L)$$

subject to the agent wanting to participate in the contract

$$p(a)u(w_H) + (1 - p(a))u(w_L) - ca \geq \bar{u}$$

subject to the incentive compatibility constraint

$$a \in \arg \max_{\hat{a}} p(\hat{a})u(w_H) + (1 - p(\hat{a}))u(w_L) - c\hat{a}$$

$$\Leftrightarrow p'(a)[u(w_H) - u(w_L)] = c$$

If an agent is intrinsically motivated, then it is possible to replicate the first-best outcome in a second-best world even in the absence of monetary incentive pay. To see this, suppose for simplicity that both the principal and the agent are risk-neutral. From the first-best optimal effort condition derived above, it follows immediately that the service provider will put in the optimal amount of effort if his preferences are

completely aligned with society, that is, he receives the same intrinsic net benefit as society, $q_H - q_L$ if the service is delivered successfully. If preferences are not perfectly aligned between the principal and the agent, then it is possible to motivate the agent through monetary means. This is achieved by making the wage spread $w_H - w_L = q_H - q_L$ and setting $w_L = \bar{u} + ca - p(a)[w_H - w_L] < \bar{u}$ to extract all surplus from the agent. Hence, if the agent is risk-neutral, it is possible to elicit first-best effort at first-best cost and the optimal contract can be implemented as an up-front ‘sale’ of the output at price $-(w_L - \bar{u})$. This result partly motivates the drive for privatization in public service delivery in recent years.

Therefore, when the agent is risk-neutral, incentive pay can replicate the first best outcome of perfectly aligned tastes. However, once we allow for a richer environment of limited liability and/or risk-aversion on the part of the agent, this no longer holds, and incentive pay gets us some – but not all – of the way towards first-best. Let us consider the more realistic case in which the agent is risk-averse (and the principal is risk-neutral). As above, the second-best constrained maximization problem can be written as a Lagrangian

$$\begin{aligned} \max_{a, w_i} L = & p(a)(q_H - w_H) + (1 - p(a))(q_L - w_L) \\ & + \lambda[p(a)u(w_H) + (1 - p(a))u(w_L) - ca - \bar{u}] + \mu[p'(a)(u(w_H) - u(w_L))] \end{aligned}$$

The first order-conditions with respect to w_H and w_L are given by

$$\frac{1}{u'(w_H)} = \lambda + \mu \frac{p'(a)}{p(a)}$$

$$\frac{1}{u'(w_L)} = \lambda - \mu \frac{p'(a)}{p(a)}$$

Since $\mu \frac{p'(a)}{p(a)} > 0$, the above implies that the marginal utility of consumption $u'(w_H)$ is smaller than in the first-best scenario, which in turn implies that $w_H^{SB} > w_H^{FB} = w^*$. Similarly, $w_L^{SB} < w_L^{FB} = w^*$. This is the essence of incentive pay: the agent is paid a high wage if service delivery has been successful and the quantity is high and she is paid a low wage if she has failed to deliver. This induces the agent to exert more

effort. However, note that it also requires the risk-averse agent to bear more of the environmental risk, which is not efficient from a risk-sharing point of view.

The first-order condition with respect to effort is given by:

$$p'(a)\{[(q_H - q_L) - (w_H - w_L)] + \lambda [u(w_H) - u(w_L)]\} + \mu p''(a)[u(w_H) - u(w_L)] = \lambda c$$

The additional term in the first-order condition is negative, which implies that the first term is larger and from the concavity of the probability function, this implies that second-best effort is in general smaller than under first-best. What is the intuition for this? When effort is not observable – and in the absence of intrinsic motivation – the agent needs to be motivated to exert effort by taking on some of the risk associated with producing the service. However, this can only be achieved in exchange for a drop in welfare for a risk-averse agent. If welfare falls too much, the agent will simply no longer be prepared to participate in the contract.⁶ As explained in Bolton and Dewatripont [7]: “Paradoxically, the principal perfectly predicts the effort level associated with any incentive contract and realizes that the reward or punishment corresponds only to good or bad luck. Nevertheless, the incentive scheme is needed to induce effort provision.”

Hence, in the second-best environment, there is now an inevitable trade-off between insurance and incentives, which will be more severe, the more pronounced is environmental uncertainty and the more the agent cares about this. This trade-off involves rewarding the agents for good outcomes and punishing him for bad ones. Beyond that, it is difficult to describe the optimal wage contract in more detail – in fact, the compensation contract will generally be non-linear and quite complex – based on our simple model. As mentioned above, we can derive an explicit relationship between the constrained optimal wage contract and environmental uncertainty and the agent’s degree of risk-aversion if we make some more explicit assumptions about the parameterization of the problem. Let us assume that output is

⁶ As pointed out earlier, if doctors did not have professional insurance – which essentially protects them from taking on too much risk – it might be difficult to attract anyone to the medical profession.

normally distributed, such that $q = a + \varepsilon$, where $\varepsilon \sim N(0, \sigma^2)$ and the agent has constant absolute risk-aversion (which means that his aversion to risk does not change as he gets wealthier) measured by the parameter η and the cost of exerting effort is given by $\frac{c}{2}a^2$. Moreover, it is imposed that the agent's wage is a linear function of observed performance $w = t + sq$, which implies that the agent will choose $a = \frac{s}{c}$. Just as above, it is easy to see that eliciting first-best effort requires $s = 1$, as this means that the preferences of society and the agent are perfectly aligned. The closed-form expression for the optimal intensity of incentives under second-best is

$$s = \frac{1}{1 + c\eta\sigma^2}$$

Hence, the intensity of incentives and effort decrease – and the departure from first-best welfare therefore increases -- when the cost of effort, the degree of risk-aversion or the variance of output go up.

To sum up:

- Under first-best, eliciting optimal effort is independent of the need to provide insurance. A risk-neutral principal will fully insure a risk-averse agent.
- Under second-best when effort is unobservable and output is only an imperfect measure of effort, eliciting effort requires that the agent is rewarded for good performance and punished for bad performance.
- In general, this implies that effort and total surplus depart from first-best because incentivizing a risk-averse agent by making him bear risk results in a welfare loss. If this loss becomes too large, the agent no longer participates in the contract
- The departure from first-best will be larger the more risk-averse the agent and the more environmental uncertainty he faces.

The difference between first-best and second-best in the moral hazard problem is illustrated in Figure 2, which plots the percentage of the first-best total surplus and first-best effort that is achieved by the second-best contract as a function of the ability to offer incentive pay measured by $u(w_H) - u(w_L)$.

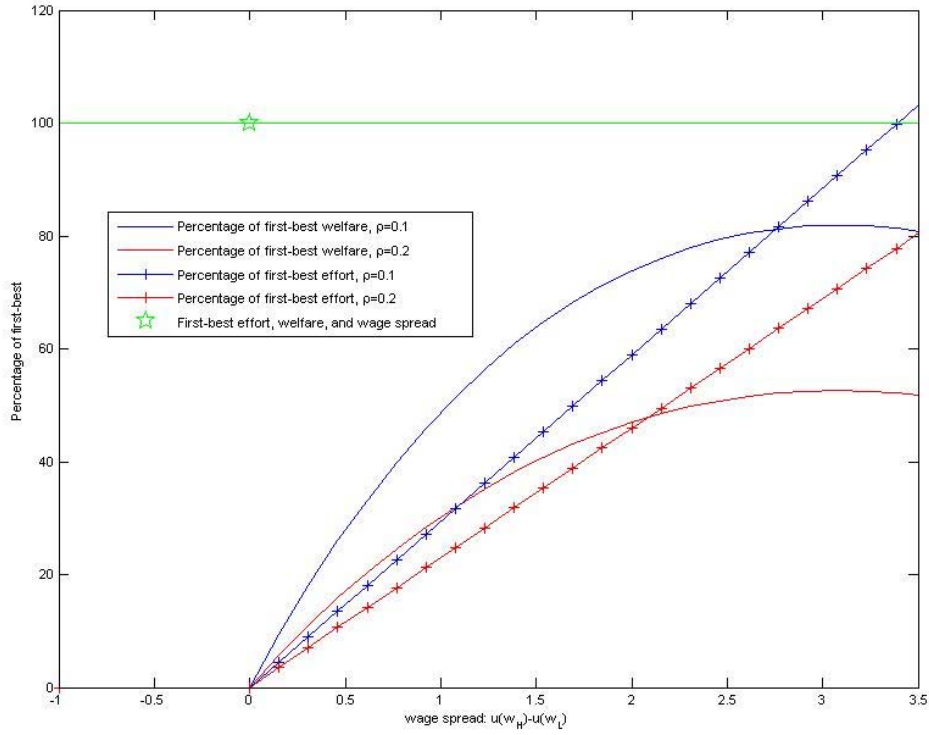


Figure 2: Comparing first-best and second-best in a hidden action problem

The problem is parameterized as follows: $q = \{20, 10\}$, $c = 5$, $u(x) = \frac{1}{1-\rho} x^{1/(1-\rho)}$, where ρ measures how risk-averse an agent is. We calculate the first and second-best contract for two levels of risk-aversion $\rho = \{0.1, 0.2\}$ in order to explore how risk-aversion and uncertainty affect the second-best contract. The percentage of first-best welfare is measured as

$$\frac{V^{SB}(P, u(w_H) - u(w_L)) - V^{SB}(P, u(w_H^{FB}) - u(w_L^{FB}))}{V^{FB}(P, u(w_H^{FB}) - u(w_L^{FB})) - V^{SB}(P, u(w_H^{FB}) - u(w_L^{FB}))} \times 100$$

Again, it is noticeable from Figure 2 that a second-best contract can get us a long way towards first-best. The shortfall is more pronounced the more risk-averse the agent is because with diminishing returns to consumption it becomes ever more costly to incentivize the agent to exert effort by making him bear risk. When $\rho = 0.1$, a well-designed incentive contract achieves about 80% of first-best welfare. When $\rho = 0.2$, this percentage drops to 40%. As already hinted at, the optimal wage spread under

second-best is larger than under first-best, because the agent needs to be induced to work hard by making pay contingent on successful performance. Under first-best, total surplus is maximized where $w_H = w_L$, because it is optimal for the risk-neutral principal to provide full insurance to the agent while insisting that first-best effort is exerted. In contrast, the highest surplus under second-best is obtained by moving all the way up the spectrum and using a wage spread of 2.6. Again, we examine what happens if wages cannot be differentiated as much as is necessary across states of the world to get the constrained optimal result. To do so, we also calculate the second-best contract for all values of $u(w_H) - u(w_L)$ such that $u(w_H^{FB}) - u(w_L^{FB}) \leq u(w_H) - u(w_L) \leq u(w_H^{SB}) - u(w_L^{SB})$. It can be clearly seen that moving from the second-best wage spread to the first-best wage spread, which involves full insurance of agents in terms of wages, makes us worse off in a second-best world. The same lesson as in the hidden action model applies: using first-best policies in a second-best world leads to third-best outcomes. This analysis directly applies to service delivery in a second-best world. Contracts customarily replicate first-best wage policies by insuring civil service employees against all risk. However, in the absence of observable effort and/or intrinsic motivation, this results in the third-best outcome of no effort being exerted.

In terms of practical implementations, concerted efforts have been made recently to introduce explicit incentives into public sector reforms. In developing country contexts, there is a host of evidence on providing explicit incentives to teachers, either by monitoring inputs or rewarding outputs (Banerjee and Duflo [3]). The evidence on the success of these programs so far is mixed, however. While taking pictures of teachers at the beginning and end of the school day was found to increase attendance in Indian schools, the impact on student scores was more moderate (Duflo and Hanna[14]). Cost and scalability outside of NGO-run schools are concerns in such programs. On the other hand, particularly distortionary effects have been found in some studies of performance-related pay schemes that reward outputs. Glewwe et al. [18] find that providing merit pay to teachers on the basis of student test scores brought about modest, short-run gains in scores at the cost of a host of distortionary practices: conducting test-preparation sessions without changing pedagogy or (low baseline) attendance rates. Any learning gains among students in this program were found to evaporate after its completion. Political-economic problems pervade the

implementation of explicit incentive schemes for public servants as well: these have been met with fierce opposition in the education sectors of Kenya and Uganda; while Chen et al. [8] show that head teachers can corrupt attempts to provide accountability for teachers in general.

Thus, while the mechanisms detailed above are in principle straightforward to implement by well-designed incentive contracts, practical experience shows this to be more difficult. Moreover, departing from our simple model and allowing for more complex environments in which outputs are imperfectly measured, rely on several inputs, and where intrinsic motivation may interact with explicit monetary incentives, we find that the naive application of contingent pay may not be appropriate to achieve quality service delivery.

First of all, public service delivery is the classic example of an area that is characterized by "a multiplicity of dimensions - of tasks, of the stakeholders and their often conflicting interest about the ends and the means, and of the tiers of management and front-line workers" (see Dixit [13], Prendergast [23]). To put it more simply, the incentive mechanisms listed above all rely on the fact that while inputs may be unobservable, outputs are and can form the basis of an explicit contract. However, this assumption may simply not hold in public service provision and is in fact often cited as one of the reasons why the production of certain goods cannot be left to the private sector. When there are multiple outputs, the naive application of high-powered incentives to those dimensions of output that are measurable (e.g. producing output at lowest possible cost) while others are not (e.g. quality innovations) may in fact be counterproductive (see Holmstrom and Milgrom [22]; Frey and Oberholzer-Gee [17] and Baker [2], Hart et al. [19]) in the sense that effort provision is skewed towards the measurable task.

A growing body of empirical evidence supports the notion that the effectiveness of explicit incentives will not hold when measures of performance are distortionary or noisy or open to collusion or other forms of strategic manipulation. Moreover, an emerging consensus sees this multiplicity of dimensions and imperfection of performance measures as characteristic of many public services (see Dixit [12]).

A second, related problem is that, when agents are intrinsically motivated, high-powered, explicit incentives can actually reduce the effort they provide. This consideration, which has entered economists' models only relatively recently, comes from a well-established literature in experimental psychology reviewed in Benabou and Tirole [4, 5], which argues that explicit rewards---far from reinforcing good behaviour---actually have a negative effect on subjects' effort and motivation (Deci [11]).

Seminal work in psychology has defined intrinsic motivation as the willingness to perform an activity "when one receives no apparent reward except the activity in itself" (Deci [11]), p. 105]. Further refinement is required, however, to understand the interplay between extrinsic and intrinsic incentives. Intrinsic motivation, broadly, can be either output oriented or action oriented (Andreotti (2000)). It is characterized as output-oriented when agents have preferences of outcomes, irrespective of the manner in which these are achieved. This will be true, for example, when agents' utilities are aligned with social welfare. Alternatively, intrinsic motivation is action-oriented when agents are intrinsically motivated by a desire to provide social goods themselves (a phenomenon that (Andreotti (2000)) has termed "warm-glow giving"). This latter, "impure" form of altruism may obtain either when motivated agents derive direct benefits from providing a service that (partially or fully) offset costs of effort, or when agents have preferences for delegation of decision-making authority per se.

At a minimum, both action or output-oriented intrinsic motivation imply that weaker explicit incentives are required to achieve socially optimal levels of effort or investment in public-service delivery. Stronger still, strengthened explicit incentives may actually lessen these effort levels. The literature provides several potential mechanisms. For example, Cantor (2005) argues that in a multitask environment when explicit incentives are linked to a subset of tasks, they can crowd out the intrinsically motivated contribution of other, complementary forms of investment by forcing the agent to reallocate effort in a socially suboptimal way. Benabou and Tirole [4] suggest an alternative mechanism – though perhaps not the most obvious one – by which this crowding out could occur. Intrinsic motivation in their paper is defined as the direct satisfaction the agent derives from performing a task. This benefit depends on the attractiveness of the task, which in turn may be related to the

agent's ability to perform but also the type of task under consideration. Both the agent and the principal are uncertain about these parameters, but the principal's information is superior relative to the agent. Given the information revealed to the principal, the use of explicit incentives is decreasing in the attractiveness of the task. Therefore, if the agent is presented with a high-powered incentive contract, he will interpret this as a signal that the task he is asked to perform is less attractive and he will therefore downgrade his estimate of the intrinsic benefit he will derive from performing it. By extension, he will put less effort into providing the task because the payoff from completing the task successfully is likely to be lower. While these and other models make important contributions, the literature has not converged on a unified framework for understanding the interplay between explicit incentives and intrinsic motivation in a moral hazard context.

Nonetheless, the potential for explicit incentive schemes to crowd out intrinsic motivation has been documented empirically. For example, in the well known story of the Israeli daycare center that introduced fines for parents who arrived late to pick up their children [18]. Rather than responding by arriving more promptly, as standard theory would suggest, parents evidently interpreted the fine as making their arrival time an economic transaction, outside the realm of moral obligation.

While the above papers tell a cautionary tale about the naïve application of incentive pay in the delivery of public services, it would be equally naïve to dismiss any use of performance pay on the grounds that it may potentially crowd out intrinsic motivation. Much of this literature takes as its starting point an environment in which things generally work because agents have at least some level of intrinsic motivation. In contrast, we are concerned with a pathological setting in which intrinsic motivation is notably absent – and crowding out is therefore of little concern. While performance contracts cannot replicate the first-best outcome, they certainly have an important role to play in improving upon the currently dismal performance of public service delivery in fragile states.

3.3. Create a marketplace for service delivery

The mechanisms discussed above are contractual models available to an ISA that would allow it to better contract a *single* agent to complete a *single* task. However,

once we recognize that there are many, related tasks to be performed – there are schools and clinics to be run in many villages and towns – this opens up a distinctive policy tool: the ability of an ISA to create a *marketplace* for delivery of a service.

Such a marketplace has at least two distinctive features. First, a wide range of potential service providers, from private-sector firms to NGOs to the government itself, would be able to bid for contracts to provide a given service. In this context, a well designed market can effectively match individuals with strong intrinsic motivation (or location-specific comparative advantage) to particular tasks – a phenomenon that Besley and Ghatak [6] term “mission matching”. Second, the contracts for individual service providers can make explicit use of information gained by watching their peers in related sectors or locations. In the presence of limited liability constraints or risk-averse agents, use of such “yardstick competition” [20, 21] allows a (risk neutral) ISA to provide stronger incentives – and so achieve higher levels of service provision – than when contracts are made with individuals in isolation. These two features are described in turn below.

Mission matching

The extent of intrinsic motivation may be specific to specific tasks or beneficiaries. Besley and Ghatak’s [6] model of *mission matching* illustrates this point: the extent of agents’ intrinsic motivation may depend upon the whether they are matched with an organization or task for which these sentiments apply.

Besley and Ghatak model intrinsic motivation as a payoff to successful completion of a task that is specific to the agent-task match. To understand this in the framework of Section 3, we make the simplifying assumption that all agents have similar abilities (such that $\theta_L = \theta_H = 1$). Translating their model to our own notation, agents of type i matched with a task of type j receive a payoff of $r + t + \varphi_{ij}$ if the project is successful, and a payoff of r otherwise. The parameter φ_{ij} captures the quality of the “mission match”: when motivated agents are matched to projects that suit their type, this parameter takes on a larger value than when they are poorly matched (or matched to tasks in a different sector that do not harness their intrinsic motivation).

When effort is not directly contractible but agents’ types are known and exogenously matched to tasks, then one implication is that intrinsic motivation and extrinsic

incentives are perfect substitutes in the optimal contract. Greater mission-specific motivation of agents makes bonus payments r less necessary, and the implication is that – given the contract selection process at work – there will be higher effort where incentives are weakest. Notably, there is no “crowding out” of intrinsic motivation by extrinsic incentives in this model, a concern addressed in Section 3.2.

When matching is not exogenously given, but rather is determined by a market, an encouraging finding is that efficient matches tend to arise. Besley and Ghatak show that a stable endogenous matching process must efficiently assign agents to tasks for which they have high intrinsic rewards. For example, when the outside option of motivated agents is a fixed reservation payoff (e.g., unemployment), and when the principal has a higher return to successful completion of a task than does the agent, then the optimal incentive contract will set the fixed payment t equal to the reservation wage and the bonus payment r equal to half of the difference between the payoffs to the principal and the agent:

$$r^* = \frac{\pi_i - \varphi_{ii}}{2},$$

where π_i is the payoff to the principal from successful completion of task i , and φ_{ii} is the payoff to an agent intrinsically motivated to perform type i and matched accordingly.

In practical terms, Besley and Ghatak’s results on endogenous matching suggest that a marketplace in which frontline service providers submit bids for specific jobs would have an equilibrium in which providers sort into the jobs for which they are well motivated.

There exists some empirical evidence to suggest that the motivation of service providers is relationship-specific—that is, that it depends on their relationship to the clients. For example, Serneels et al. [24] provide evidence from a survey of nursing candidates in Ethiopia to show that health-sector workers do differ in their willingness to work in rural areas. Thus agents in service delivery may be considered heterogeneous with respect to their intrinsic motivation in the absolute, or with regard to specific missions. In the latter case, the institutional challenge is to create an

efficient match between agents and missions in order to take advantage of mission-specific motivations.

Yardstick competition

Even when agents all have the same preferences – so that there is no scope for mission matching – a contract design that takes advantage of the existence of multiple, related tasks can achieve better service delivery. Intuitively, yardstick competition works not by making agents compete with each other, but by allowing the contracting agency to learn about common shocks to performance. In pure bilateral contracting, these same shocks reduce the principal’s ability to profitably make the agent the bearer of risk, either because of limited liability or risk aversion on the part of the agent. But when multiple agents are observed and the shocks that intercede between their efforts and contractible measures of output are correlated across agents, the principal can do better. This is a variant of Holmstrom’s *informativeness principle* [20]: when agents’ efforts are imperfectly observed, a principal will always do better by incorporating into the contract any information about the ‘state of the world’ that affects the realization of an agent’s efforts. The function of yardstick competition, then, is that the performance of an agent’s peers is informative about the shared conditions under which she operates.

This can be shown with a slight modification to a standard model of moral hazard with risk averse agents.⁷ Suppose a risk-averse principal contracts with two agents, i , who produce output q_i with effort a_i according to

$$q_1 = a_1 + e_1 + \alpha e_2$$

$$q_2 = a_2 + e_2 + \alpha e_1,$$

where e_i are normally distributed shocks. Wage contracts are assumed to take the form

$$w_i = z_i + vq_i + uq_j,$$

⁷ The presentation of this model follows Bolton and Dewatripont [7]

so that they depend on the outcomes of both agents. Agents are assumed to have CARA preferences over their risky income and quadratic costs of effort. As before, each agent will choose effort to maximize their certainty equivalent income – that is, the amount of income that they would need to receive with certainty in order to make them indifferent between this income and the risky realization of their wages. Since each agent must find the contract sufficiently enticing to want to take this deal, the principal will want to minimize the associated risk premium (that is, the difference between certainty equivalent and expected income, for a given effort level). To do so, when unobserved shocks are positively correlated (i.e., α is positive), the principal will make agent 1's income *decreasing* in agent 2's output, and vice-versa. The optimal contract in this case sets $u = -\left(\frac{2\alpha}{1+\alpha^2}\right)v$ (see Bolton and Dewatripont [7] for details of the derivation).

An example may make this more concrete. Suppose that separate bids are put out for contracts to deliver health services in two neighboring districts of a given country. Under-five mortality rates are established as an indicator of performance and contracts are incentivized accordingly. Now, firms may be reluctant to undertake such contracts – they may submit bids that build in high premia in the form of compensation for fixed costs – because under-five mortality is difficult to control, and they are exposing themselves to considerable risk. This limits the strength of incentives that can be put on service providers.⁸ But note that some of the riskiness of this outcome measure is common across locations: the spread of an infectious disease, or a famine, will be experienced in common. If the ISA can judge performance relative to a national average, for example, then this would insulate particular providers from exposure to these common shocks in their incomes. As a consequence, they can be given stronger incentives without overburdening them.

⁸An example from Haiti makes a related point [15]. When USAID introduced performance-based contracts for health service provision in 1999, several contractors passed on these incentives to their frontline providers. One provider went as far as to cut base salaries in half, making payment of the remainder contingent on performance. They quickly found employees so demoralized that they retreated from these highly incentivized contracts to increase base pay.

3.4. Decentralize service delivery

Contracting for service delivery by an Independent Service Authority can be undertaken at local or national level. A decentralized model might involve a series of local service commissions, meeting regularly with an oversight board that included elected government and donor agencies. It should be recognized that such a model may stretch administrative capacity – but it can be desirable for other reasons.

Cremer et al. [10] divide arguments in favor of decentralization into *ex ante* and *ex post* arguments. The *ex ante* argument for decentralization supposes that public goods have different characteristics across space, so that a decentralized allocation process can better tailor the service mix to local demand. Moreover, information about performance is thought to be more accurately perceived at the local level. While an ISA would not set the balance of services across sectors – such policy priorities would be set through the national political process – it may nonetheless be the case that decentralized choice of performance indicators or other targets can embody some of this benefit. The *ex post* case argument for decentralization is that a mobile population will select into locations that match their preferences; such Tiebout sorting [26] reinforces *ex ante* welfare benefits of decentralization.

However, these benefits must be weighed against economies of scale and the benefits of coordination that accrue from contracting at a higher administrative level. Cremer et al. [10] argue that the loss of information that occurs when contracting is done at a higher level can be avoided in theory: federal governments can write contracts in such a way as to induce local governments to reveal their information about performance or preferences, though a world of incomplete contracts – in which not every contingency can be foreseen – reintroduces this tradeoff between local information and central efficiency. Political capture is also a threat when processes of contracting are decentralized (see Conning and Kevane [9] for a review of theory and evidence). Capture is of course not unique to local government. Accountability is required to keep capture in check at any level, however; and while federal government and donors will be better able to scrutinize processes that take place at the national level, the fact that a decentralized ISA administration would be only indirectly accountable to the local electorate places inherent limits on democratic accountability under decentralized contracting limited as an alternative.

3.5. Break corrupt equilibria

A further role for the creation of new institutions of service delivery is that, sometimes, *non-marginal change* may be required to shift from an equilibrium in which agents have poor incentives to provide public services to an equilibrium in which they have incentives to perform well. In essence, this may be true because organizational reputations for low motivation can be self-perpetuating.

The incentives for agents to provide public services depend on their reputations. This can occur for several reasons. Individuals who are believed to be corrupt may have little incentive to act otherwise. Those believed to be corrupt may be given less responsibility, while the payoffs to performing well are higher when one's responsibility is greater.

As Tirole [27] points out, reputations are an inherently dynamic phenomenon, since they are built or broken by past actions. When individuals work in groups, and the contribution of each individual cannot be perfectly distinguished, then even those who are new to an organization may inherit the reputation of the organization itself. If this reputation is a bad one, even fresh-eyed recruits may find themselves with incentives to perpetuate the poor reputations of their predecessors.

Tirole [27] provides a model of such reputational effects that is instructive for our case. In Tirole's model, principals can choose from two types of tasks to give to agents. The first of these tasks has a high social return if the agent works hard, but is susceptible to shirking; the second is less sensitive to effort but yields lower returns even when successful. Applied to service delivery, we may think of this as reflecting a choice between *delegation* and *control*. (Related work by Sliwka [25] argues that delegation yields higher payoffs when agents are motivated, while an approach of top-down control may be best when agents have low motivation.) If agents' past behavior is imperfectly observed, then corruption can be self-perpetuating. Intuitively, principals in such an equilibrium believe that the fact that they have not observed a particular agent to be corrupt is a failure of their observation, not a reflection of the agent's truthful behavior. Given this belief, principals will not delegate (in our example); and given that delegation never occurs, agents have no incentive to maintain a good reputation. A cycle of corruption is self-reinforcing.

How can such a low equilibrium be broken? A change in institutions may help. In the model of Tirole, a single organization never recovers from even a one-off shock of corrupt behavior, in part because principals cannot distinguish between agents who were present and those who were not. By allowing new entrants into the sector to join alternative organizations where they will not be burdened by the reputations of their predecessors, an ISA can break this trap.

This notion has close parallels in the literature on coordination games in evolutionary game theory. The imperfect observability of past behavior – and the effects of collective reputations – has a close parallel in the notion of *fictitious play* [28]. This is a dynamic in which individuals (say, the principals in our model of service delivery) choose from their available actions (say, delegation or control) as a best response to an observed sample of the history of the organization with which they interact. It is a now-standard result in the literature on the establishment of conventions that risk-dominant strategies emerge from such dynamics – even when the resulting equilibria are Pareto inferior – when the populations of players are immobile.

However, Ely [16] has shown that when players are *mobile*, efficient play can arise. The intuition for this is as follows. When the organizational structure is fixed, it is harder to escape from risk-dominant equilibria than it is to escape from risk-dominated equilibria, since the former takes relatively many people experimenting with ‘good’ behavior. But when new organizations can be set up, unburdened by past reputations, payoff-dominated equilibria can be escaped more easily. All it takes is one enterprising individual to start a new group by working well. Others will be attracted to interact there and, at this new location, the best response on all sides is to reinforce positive behavior.

4. Can an ISA monitor service-providing organizations?

An ISA shifts the problem of motivating the workers who provide services from the government to independent organizations. However, the ISA still has the task of monitoring both its own direct employees and the service-providing organizations, and service-providing organizations still have the task of motivating their workers in turn. Why might this shifting of responsibility be any less difficult?

4.1. At each level, the relative flexibility of contractual design that an ISA allows, together with the specific contractual and institutional tools of Section 3 can be used to improve upon the status quo of service provision in fragile states.

Contractors’ challenge: incentivizing frontline providers

The act of delegating provision of a service does not by itself solve the inefficiencies that typically arise in a principal-agent framework of the type described in Section 3. We argue that, compared with what can be achieved by a civil service with low morale, an approach of contracting out can better incentivize doctors, teachers, and other frontline service providers. This is the case for four reasons.

First, private and not-for-profit providers have access to contractual mechanisms that for political reasons are infeasible in the civil service. There are certainly examples of performance contracts in the public sector, although to introduce such contracts within the civil service of a fragile state may require internal capacity that is not available. Political constraints often mean that, while public servants can be offered bonuses for good performance, they are rarely punished – either in explicit performance incentives or in the implicit threat of firing – for poor performance. This form of politically induced limited liability constraint has the same implication for the choice of incentives as does risk aversion: given this constraint, it will not be optimal to give public-sector employees sufficient incentives to provide socially optimal effort levels. To do so would require overpaying on average.

By contrast, experiences with contracting out for public services suggest that private and non-profit organizations have and use a broader array of options. For example, when USAID provided performance incentives to health-sector contractors in Haiti in 1999, one of these contractors went as far as to cut base pay for its frontline providers in half, making the remainder performance-contingent (Eichler et al. 2001). While the contractor quickly backtracked, upon observing the demotivating effect of such strong incentives upon its employees, the case serves to demonstrate flexibility. A more robust example of the benefits of this flexibility comes from Cambodia (Bloom et al. 2006), where a randomized controlled trial of mechanisms for contracting out health services was undertaken in 1999. Firms that were given full control over their hiring, firing, and contracting processes did put in place punishments for poor performance by individual staff members – however, these took the form of the threat

of firing on the basis of poor performance. This feature, among other contractual innovations, led to a significant improvement in a number of health indicators. More broadly, then, non-state contractors will be better able to motivate their employees to the extent that they are given the freedom to implement a variety of contractual tools.

Second, the creation of a pool of contractors that compete with each other to particular services in particular locations can improve the motivation of frontline providers by creating scope for *mission matching*, as described in Section 3.3. Here the very heterogeneity of the contractors is helpful. To take a theoretical example from Besley and Ghatak (2005), allowing service providers to compete in part by choosing their missions – which may be defined in terms of curriculum choices, religious orientation, or geographic specialisation – can improve the productivity of *all* schools by allowing more efficient sorting in the labour market.

Third, even if the same, formerly public-sector workers were to be assigned to the same tasks, contracting out can improve performance by relieving frontline providers of the burden of low expectations. This is the argument of Tirole (1996), given in Section 3.5 above. When embedded in an institution with a history of corruption or other forms of low performance, potentially productive individuals will be trusted with little authority, and so will have little reason to work well themselves. But if they are given the opportunity to move to an organization unburdened by such low expectations, productive individuals may be given – and will respond to – opportunities to make substantial contributions. Indeed, even in the Cambodian case cited above, the success of non-government contractors was partly achieved by allowing these contractors to hire (former) government workers, who were allowed leave to participate in the pilot. Unmotivated frontline providers can be given new life by a change in institution.

Fourth, part of the way that contracting out to a range of service providers can improve upon results is simply by allowing for experimentation. Actual working environments and services to be provided are sufficiently complex and diverse that there is no simple, one-size-fits-all prescription to the problem of incentivizing frontline providers. Rather than prescribing a single solution, an ISA allows a variety of contractors to implement a variety of designs. Those models that perform well will be renewed and propagated, while organizations that perform badly will see their

contracts terminated. Such a competitive environment arrives at improvements in contractual forms not by at a single stroke, but through a decentralized process of contractual innovation.

4.2. ISA to contractors

The primary responsibility left to the ISA is to provide incentives to service-providing organizations. Here too the lessons of contract design from Section 3 apply. Performance related pay and – in a more marked departure from the civil-service model – the threat of not renewing contracts for poor performers, are the standard tools here. But the ISA’s challenge of incentivizing service-providing organizations is considerably easier than the centralized provision of incentives for frontline providers, for several reasons.

First, the scale of the monitoring problem left within the public sector is considerably reduced: there are many fewer organizations than workers. Second, one of the reasons why employee performance in service provision is so difficult to monitor is that outcomes are the result of team effort. The performance of the organization as a whole may be much easier to monitor because the task of assigning outcomes to individual effort is avoided. Third, as noted above, yardstick competition enables organizations to be compared against each other, so that many shocks that may affect performance but are difficult to allow for, do not need to be considered because they are common across providers. This implies that, for a given set of performance measures, the ISA can provide stronger incentives in light of its ability to insulate individual providers from common shocks. But it also affects the choice of performance measures themselves. In general, there is a tradeoff between incentivizing performance using measures of final impacts (such as mortality rates), which capture very well the objectives of policymakers but over which individual service providers have less control, and incentivizing performance using measures of intermediate outputs (such as absenteeism rates, numbers of patients served, etc) over which a service provider has much more control but which do not fully capture society’s objectives. The latter are distortionary – they may shift providers’ attention unduly towards monitored tasks – but their use is often inevitable given the absence of a performance benchmark. Yardstick competition alleviates this constraint, by allowing service providers to be exposed to less risk in the course of performance pay

that is tied to final outcomes. Fourth, monitoring service-providing organizations is the core task of the ISA, so that over time it can develop both expertise and data. This contrasts to a multi-function ministry in which the measurement of performance is typically marginalized.

4.3. Motivating ISA employees

Finally, the ISA faces a third principal-agent problem in the inducing good performance from its own staff. In this case, explicit performance pay based on service-delivery outcomes may expose ISA employees to too much risk: the system should be designed to give incentives for ISA employees to experiment with different providers and different incentive schemes as routes to achieving results. Instead, in this case the direct monitoring of ISA staff inputs into the contracting and monitoring processes may be preferable.

Still, there are several reasons to think that efficiency in the procurement of public services will improve under an ISA. Most basically, economies of scale in procurement and monitoring allow an ISA to do the same work with fewer people than when these responsibilities are delegated within line ministries. Not only is this conducive to skill development via ‘learning by doing’, but it also allows the ISA to be selective in its recruitment. Such selectivity has benefited independent revenue authorities; for example, the Tanzania Revenue Authority had the luxury of accepting only one in three civil servants when it was founded.⁹ Moreover, the logic of green field sites applies here as well: a demotivated or corrupt civil service may be able to break from a vicious cycle perpetuated by low expectations when a new institution is founded.

Centralizing the task of procurement in an ISA can also improve performance by strengthening political accountability. Political accountability in service provision is often regarded as taking either the “short route” directly from clients to frontline providers or the “long route” from clients to providers through elected officials (World Bank 2004). But when contracting and monitoring of service providers

⁹ Prof. Benno Ndulu, personal communication.

occurs deep within government ministries, this long route is stretched even further. By bringing responsibility for delivering on politically determined priorities in service provision closer to the light of day, and by gathering and publicizing performance data at this level, an ISA facilitates political accountability as a mechanism for improving performance.

5. Conclusion

In fragile states basic service provision is radically inadequate. This is not merely due to a lack of funding: the lack of funding is in part a response to the lack of effective modalities for delivery. In these contexts an ISA is not a magic bullet: it cannot fully substitute for the breakdown of public service motivation. However, by recognizing reality it provides an escape from some of the constraints that make both direct provision by line ministries and uncoordinated provision by NGOs inherently unsatisfactory. The ISA design set out in this paper is not a straightjacket: many aspects of design are best resolved locally. However, it enables both government ministers and donors to achieve core objectives of service provision by harnessing what are now in other management contexts fairly standard approaches to the problems of staff incentives and selection.

Although variants of ISAs are already operating we are not able to point to any organization which has all the features of a fully-fledged ISA. The introduction of an ISA should therefore be seen as an experiment and evaluated accordingly. However, two considerations suggest that the cost of an experimental ISA would not be high. First, in fragile states current provision is so unsatisfactory that there is little potential for an opportunity cost. Second, and more important, it is straightforward to design transitional arrangements which leave in place all existing arrangements for service provision and simply organize incremental provision. By running two public systems in tandem, the conventional direct supply by ministries, and ISA-contracted services, the two could be compared. Were an ISA to be demonstrably more efficient the government could chose gradually to channel more public resources through it. Were

it even less efficient than the ministries then it could simply be closed. By design, an ISA generates information on its own performance.

Because ISA services would be incremental, the organization could start small and grow: there need be no big bang commencement. Not only would this be less disruptive, it enables the internal organization of the ISA to be built gradually.

For this reason there need be little organizational resistance. Government ministers would benefit both by the improved delivery of services to citizens, and to the greater control and co-branding that the government would achieve over NGO activities. NGOs would benefit from the chance to scale up their activities through major public financing, and from the opportunity to demonstrate their effectiveness. Donors would benefit from at last having a credible modality for large-scale financing of service delivery in fragile states which would in turn strengthen the integrity of the very different modality appropriate for less difficult contexts.

References

- [1] AKERLOF, G. A., AND KRANTON, R. E. Identity and the economics of organizations. *Journal of Economic Perspectives* 19, 1 (Winter 2005), 9–32.
- [2] BAKER, G. Distortion and risk in optimal incentive contracts. *Journal of Human Resources* 37, 4 (Fall 2002), 727–751.
- [3] BANERJEE, A., AND DUFLO, E. Addressing absence. *Journal of Economic Perspectives* 20, 1 (Winter 2006), 117–132.
- [4] BÉNABOU, R., AND TIROLE, J. Intrinsic and extrinsic motivation. *Review of Economic Studies* 70 (2003), 489–520.
- [5] BÉNABOU, R., AND TIROLE, J. Incentives and prosocial behavior. *American Economic Review* 96, 5 (December 2006), 1652–1678.
- [6] BESLEY, T., AND GHATAK, M. Competition and incentives with motivated agents. *American Economic Review* 95, 3 (June 2005), 616–636.
- [7] BOLTON, P., AND DEWATRIPONT, M. *Contract Theory*. MIT, Cambridge, Massachusetts, 2005.
- [8] CHEN, D., GLEWWE, P., KREMER, M., AND MOULIN, S. Interim report on a preschool intervention program in kenya. Mimeo, Harvard University, June 2001.
- [9] CONNING, J., AND KEVANE, M. Community-based targeting mechanisms for social safety nets: A critical review. *World Development* 30, 3 (March 2002), 375–394.
- [10] CREMER, J., ESTACHE, A., AND SEABRIGHT, P. Decentralizing public services: What can we learn from the theory for the firm? *Revue D'economie Politique* 106, 1 (1996), 37–60.
- [11] DECI, E. L. Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology* 18 (1971), 105–115.
- [12] DIXIT, A. Incentives and organizations in the public sector: An interpretative review. *Journal of Human Resources* 37, 4 (Fall 2002), 696–727.
- [13] DIXIT, A. Incentive contracts for faith-based organizations to deliver social services. In *Economic Theory in a Changing World: Policy Modelling for Growth*, S. Lahiri and P. Maiti, Eds. Oxford University Press, 2005.
- [14] DUFLO, E., AND HANNA, R. Monitoring works: Getting teachers to come to school. Mimeo, MIT, May 2006.
- [15] EICHLER, R., AUXILA, P., AND POLLOCK, J. Promoting preventive health care: Paying for performance in haiti. In *Contracting for public services: Output-based aid*

and its applications, P. J. Brooke and S. M. Smith, Eds. International Bank for Reconstruction and Development, 2001.

[16] ELY, J. C. Local conventions. *Advances in Theoretical Economics* 2, 1 (2002), 1–32.

[17] FREY, B. S., AND OBERHOLZER-GEE, F. The cost of price incentives: An empirical analysis of motivation crowding-out. *American Economic Review* 87, 4 (1997), 746–755.

[18] GLEWWE, P., ILIAS, N., AND KREMER, M. Teacher incentives. NBER Working Paper No. 9671, April–May 2003.

[19] HART, O., SHLEIFER, A., AND VISHNY, R. W. The proper scope of government: Theory and an application to prisons. *Quarterly Journal of Economics* 112, 4 (November 1997), 1127–1161.

[20] HOLMSTROM, B. Moral hazard and observability. *Bell Journal of Economics* 10 (1979), 74–91.

[21] HOLMSTROM, B. Moral hazard in teams. *The Bell Journal of Economics* 13, 2 (Autumn 1982), 324–340.

[22] HOLMSTROM, B., AND MILGROM, P. Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law, Economics, and Organization* 7 (January 1991), 24–52.

[23] PRENDERGAST, C. The provision of incentives in firms. *Journal of Economic Literature* 37, 1 (March 1999), 7–64.

[24] SERNEELS, P., LINDELOW, M., MONTALVO, J. G., AND BARR, A. For public service or money: understanding geographical imbalances in the health workforce. *Health Policy and Planning* 22, 3 (2007), 128–138.

[25] SLIWKA, D. Trust as a signal of a social norm and the hidden costs of incentive schemes. *American Economic Review* 7, 3 (June 2007), 999–1012.

[26] TIEBOUT, C. M. A pure theory of local expenditures. *JPE* 64, 5 (October 1956), 416–424.

[27] TIROLE, J. A theory of collective reputations (with applications to the persistence of corruption and to firm quality. *Review of Economic Studies* 63, 1 (January 1996), 1–22.

[28] YOUNG, H. P. *Individual Strategy and Social Structure: An Evolutionary Theory of Institutions*. Princeton University Press, Princeton, NJ, 1998.