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Incentives and Organizations in the Public Sector

An Interpretative Review

Avinash Dixit

ABSTRACT

The paper begins with a brief overview of the theory of incentives, with special attention to issues that are important in the public sector, in general and human capital in particular. It then reviews some case studies and empirical studies of incentives in the public sector, examining how these studies relate to the theory. Some implications for reform and design of organizations are drawn.

I. Introduction

In this paper I consider some issues surrounding incentives for workers and managers in public sector agencies and enterprises, and some implications for the evolution, design, and reform of such organizations. I do not examine questions of incentives for the citizens who deal with these agencies; for example, I do not consider saving incentives in social security or work incentives for welfare recipients or truth-telling incentives for income tax filers. Recent discussions of these issues include Lindbeck (1998).

I begin with a brief review of the general theory of incentives. This theory is now well established in economics; Gibbons (1997) and Prendergast (1999) offer excellent recent surveys. Therefore I can be quite brief and selective, focusing on aspects that are particularly relevant here.

Then I consider some special features of government agencies that make various particular models and results from the theory relevant or inapplicable in this context. Finally, I examine some cases and empirical studies in the light of the theory. This is merely the beginning of what promises to be a fruitful area for study, and my

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findings are few and tentative. For readers who like to know the bottom line in advance, here is a very brief statement.

Public sector agencies have some special features, most notably a multiplicity of dimensions—of tasks, of the stakeholders and their often-conflicting interests about the ends and the means, and of the tiers of management and front-line workers. Sometimes these special characteristics explain why these agencies are in the public sector in the first place. They also make inappropriate the naïve application of magic bullet solutions like competition or performance-based incentives. These incentives have beneficial effects in some dimensions or for some principals, but generate dysfunctional reactions in other dimensions or from other principals. Traditional incentives need selective application to specific agencies or tasks, namely those whose performance can be defined, quantified, and measured with some clarity, and where political conflicts about different aspects of the performance are relatively minor. In other agencies or tasks, other forms of incentives such as career concerns, idealism and professionalism have a role, informative but vague measures must be used, and solutions short of the ideal must be accepted.

There are also some lessons for researchers. The good news is that recent theory of incentives is beginning to be more soundly based in reality. But both empirical and theoretical research need to be better focused. Empirical research on past reforms should not look for blanket verdicts on their success or failure, but should relate the probability of success to specific characteristics of the agencies or organizations, and theoretical research on the design of new reforms should likewise pay attention to these specifics.

II. The Elementary Theory of Incentives

Economic relationships in which one party (the principal) wishes to affect the actions of another (the agent) by means of incentives are ubiquitous. In the public sector, these can arise within a government agency, with upper tiers of management as the principals and lower tiers as agents, or between an agency and its political supervisors at one end and its suppliers or clients at the other end. Such relationships can be classified into three conceptual categories according to the nature of information flows between the parties; of course in practice two or all three problems may arise simultaneously.

In the first, often labeled moral hazard (MH), the agent's action affects the principal's payoff, although the action is not directly observable to the principal. Some outcomes of the action are observable, but outcomes depend both on the action and on some other random variable, so actions cannot be perfectly inferred from outcomes. We must distinguish between two senses of observability. In the stronger sense, known as verifiability or contractibility, the outcome can be proved to third parties, so contracts contingent on it can be written and enforced. In the weaker sense, the parties to the relationship observe the outcome, and can use it to draw inferences and take future actions that they are free to choose, but the outcome cannot be proved to outsiders and so cannot be the basis of a contingent contract enforceable

at law. When the distinction is not important I will just say *observable*; when it matters I will distinguish between *verifiable* and (privately) observable.

In the second form of information asymmetry, often labeled adverse selection (AS), the agent has some private information at the time the contract with the principal is being considered. The contract must offer the agent a suitable reward—to share the economic surplus (rent) that exists in the relationship—to induce him to reveal this information truthfully to the principal.

In the third form, the agent can observe some outcome better than the principal can, and the principal has to devise a reward scheme and a costly outcome verification scheme (CV) such as an audit. The three create different kinds of tradeoffs, are handled by different mathematical techniques, and entail different kinds of optimal incentive schemes.

Of the three, MH is the one most used in thinking about public sector incentives. Its extensions to multitask, multiperiod, and multiprincipal contexts are especially relevant. Therefore I will develop these aspects in more detail, and only will mention the rest, including theories of AS and CV, with some suggestions on how these can be used in future research.

A. Incentives for Effort (MH)

The general structure of these problems is as follows: The agent takes an action a that is not verifiable. This results in a verifiable random outcome x ; the action affects the probability distribution of the outcome. The principal's problem is to devise the payment schedule $y(x)$ to maximize his expected utility of the profit $x - y(x)$. This is subject to two constraints: (1) the knowledge that the agent will choose a to maximize his expected utility which depends on $y(x)$ and the cost of action $C(a)$ (the incentive constraint), and (2) the agent must get enough expected utility out of this relationship to match his opportunity elsewhere (the participation constraint).

If the action a were directly verifiable, then y and a could be jointly chosen to achieve a Pareto optimal or first-best outcome. But since a is not verifiable, given the first-best y the agent will in general not find it optimal to choose the first-best a . This creates the moral hazard for the agent.

Without specifying more about the various functions, very little can be said about the solution; see Grossman and Hart (1983). In practice, attention has focused on two types of payments schemes:

Linear: This gives the agent a base salary k and a marginal reward or bonus m per unit of x produced, for a total of

$$y(x) = k + mx.$$

The conditions for such a scheme to be truly optimal are quite stringent; see Holmström and Milgrom (1987). But even when the rigorous conditions are not met, such schemes are often used in practice for their simplicity and relative robustness against manipulation, and in theoretical models because they provide useful simple intuitions.

If (1) x equals a plus a normally distributed error with variance v , (2) the agent's cost of action is quadratic, $C(a) = \frac{1}{2} ca^2$, and (3) both parties have constant absolute

risk aversion, R for the principal and r for the agent, then assuming a linear scheme and choosing its coefficients optimally, we find the marginal bonus coefficient to be

$$m = \frac{1 + Rcv}{1 + (r + R)cv}.$$

Then the base salary k is chosen to satisfy the agent's participation constraint. This formula offers much useful intuition.

First, $0 < m < 1$; the agent gets only a fraction of the output of his action (or bears only this fraction of the loss of output his inaction causes) at the margin. This fraction is smaller (the incentive to action is weaker), the larger is the variance of the error with which the observable output indicates the underlying effort. Even in the private sector, the firms' bottom line or its stock price is affected by so many other random influences that it is a poor measure of the top management's efforts, and therefore their incentives are quite weak; see Garen (1994). In the public sector output is often even more vaguely measured, so the problem is worse. I will consider the consequences of this, and some ways of getting around it.

Incentives can be sharper when the agent is less risk-averse: a low r implies a high m . In the extreme case of a risk-neutral agent ($r = 0$), we get $m = 1$; this is as if the principal sells the activity to the agent for a fixed fee. More generally, this formulation emphasizes the tradeoff between the agent's risk and incentive.

The bonus coefficient is higher when the principal's risk aversion R is larger. This may be of little importance in the private sector, because many risks to a private firm's bottom line can be diversified away using the capital market. In fact it is usual to assume $R = 0$ and write the formula as

$$(1) \quad m = \frac{1}{1 + rcv}$$

But politicians and managers cannot so easily diversify the risks of bad outcomes of public policies and agencies. In fact, there are critical threshold levels of public tolerance, and politicians are very risk-averse at these outcomes. Therefore they may have to use incentive schemes that are very steep there, like the step function (2) below.

Step Functions: These incentive schemes consist of a threshold level of output x_0 , a higher or reward level y_h of payment to the agent for meeting or exceeding the threshold, and a lower or punishment level y_l for falling below it. Thus

$$(2) \quad y(x) = \begin{cases} y_l & \text{if } x < x_0 \\ y_h & \text{if } x \geq x_0 \end{cases}$$

Examples of such schemes are quotas for salespersons, and the threat of firing a manager when the agency's performance falls below a set level.

Step function schemes can be very useful in implementing an action a^* the principal desires if the probability of x exceeding x_0 is very sensitive to a in the neighborhood of a^* . If this effect is sufficiently strong, the first best can be approximated; see Mirrlees (1975) and Holmström (1979). The intuition is that the agent can be

given a sufficiently large expected utility to meet his participation constraint if he takes the desired action, but has a sufficiently large fear of suffering the drastic penalty if he slackens his effort even marginally. However, step function schemes provide no incentives at the margin within the regions of outputs above x_0 and below x_0 . Therefore they cause agents to relax if they are confidently in the former region and to give up if they are likely to be stuck in the latter region. The schemes also are vulnerable to manipulation or gaming in intertemporal settings; we shall see some examples of this below.

In practice we often see a combination, where the payment schedule has a break at a threshold level, and linear rewards or penalties on either side of it. Such a scheme combines the merits and drawbacks of the two pure types.

B. Incentives for Information (AS)

If the agent has advance private information that affects the principal's payoff, the principal can design the contract to cope with this. The word "advance" is important. Incentives to acquire new information are an MH problem. But if an agency already knows more about its capabilities before the principal sets or reforms the compensation scheme, then that is an AS problem.

In AS situations, the agent generally benefits by misrepresenting his information in one direction or the other. For example, an applicant for a managerial position may exaggerate his skill to improve the chances of being hired, while an incumbent manager of a public sector agency may want to understate his agency's capabilities so as to obtain less demanding tasks. The principal wants to design a mechanism to elicit the truth. The general theory of this is governed by the revelation principle, which can be traced back to Mirrlees (1971), but is most clearly stated and proved in Myerson (1982). The idea can be easily understood using an example based on Baron and Myerson (1982) or Laffont and Tirole (1993).

Suppose the government wants to procure a good or service—an aircraft or a school—from a producer. The government does not know the unit cost of production; it could be either low (c_l) or high (c_h). Therefore the producer will be tempted to pretend to have the high cost so as to get a high payment, and take the surplus in the form of profit (if the producer is a private firm) or perks or an easy life (if a nonprofit or public sector agency). To the extent that competition among rival producers or auditing cannot solve this problem, the government must resort to an incentive scheme suitably designed to reveal the truth. The government should offer a menu of two contracts, specifying the quantity q the producer will supply and the total amount R the government will pay him. One contract, (q_l, R_l) , is intended for the low-cost case; the other, (q_h, R_h) , is intended for the high-cost case. A high-cost producer has no temptation to cheat. Therefore the payment in that case need only cover the full cost: $R_h = c_h q_h$. But a low-cost producer must be allowed just enough profit to offset what he would have made by pretending to be high-cost, namely the difference in unit costs ($c_h - c_l$) times the quantity q_h that he would have sold under this pretense; thus

$$(3) \quad R_l = c_l q_l + (c_h - c_l) q_h.$$

Then each cost-type of producer will pick from the menu the contract that is intended for that type.

By doing this, the government has to share some surplus or rent with a low-cost type producer. To keep this down, the quantity q_h will be reduced below what would equate social marginal benefit and marginal cost under full information; the amount of the reduction will depend on the probability of the producer being low-type.

If there are more than two cost types, then the menu will consist of a set of contracts of which one is intended to be chosen by each type of producer, and the payments for each contract are calculated in a way similar to that above, so as to secure truthful self-selection by all types. If the cost can be anything in a continuous range, then the menu becomes a correspondingly continuous nonlinear revenue schedule $R(q)$.

With moral hazard, we could measure the power of an incentive scheme by the magnitude of the marginal payment coefficient m . With adverse selection, we can similarly measure the strength of an incentive scheme by how far it departs from cost-plus; in the above example this was the term $(c_h - c_l)q_h$ in Equation 3.

The theory of AS has been applied to some government procurement questions, but has the potential for much more. For example, it can help the top tier of an agency calculate the rewards that must be given to lower tier managers and workers to reveal their information truthfully even though they do not value outcomes in the same way as the top management does—something that happens in agencies like JTPA, as we will see below. Even in the procurement context, the theory has not been used as widely as it should. Here is a major opportunity for applied research in the future.

C. Costly Verification (CV)

Here the agent gets to know an outcome, and can benefit by misrepresenting it to the principal: An insured can exaggerate his loss or a taxpayer can understate his income. On receiving the agent's report, the principal may either accept it or find out the truth using a costly audit. The difference between AS and CV situations is that in AS the agent has the information advantage even before the two parties enter into the contract, whereas in CV he gets the information post-contract. But the revelation principle applies, and the principal can optimize his objective subject to the agent's incentive compatibility and participation constraints.

Some general features of the optimal scheme, found by Townsend (1979) and Mookherjee and Png (1989), are as follows. If the agent reports the outcome that is worst for him, he is not audited. If he reports any other state, he is audited with a prespecified probability; the better the state for the agent, the higher the probability of the audit. If the audit reveals that the agent told the truth, he is given a reward; if it reveals a lie, the agent is fined. The probability as a function of the reported state, and the reward and fine as functions of the report and the truth, are all calculated to achieve truthful revelation at least cost to the principal.

Costly ex post auditing of agencies is an important feature of most public sector agencies; this creates research opportunities for using this theory to design optimal audit procedures.

III. Some Extensions of the Theory

The basic information asymmetries, and the incentive schemes to cope with them that were sketched in Section II, present themselves in practice in more complex ways. In this section I briefly state some of these, in conceptual categories taken one at a time. In practice they arise in combinations, for example multiple dimensions of objectives and tasks, and multiple principals, are often present simultaneously. In subsequent sections I will consider applications of this kind ad hoc, combining insights from the separate theoretical analyses as necessary.

A. *Intertemporal Aspects*

In practice, most principal-agent relationships develop over a period of time, during which the agent takes actions several times and the principal observes output several times. This opens up new possibilities for incentive schemes. Here are some:

Smoothing Over Time: In repeated MH problems, the principal can arrange a stream of payments to the agent that smooths the agent's consumption. Conversely it makes the principal's profit more volatile, but a risk-neutral principal does not mind this. A risk-averse agent benefits from the smoothing; in fact if the discount rate is very low, the smoothing effectively brings the agent close to risk-neutrality and the outcome close to the first-best; see Radner (1985) and Fudenberg, Milgrom, and Holmström (1990). In CV problems, the agent's persistent assertion that poor outcomes are the result of bad luck becomes less credible over time and justifies an audit; knowing this, the agent will desist from making such false claims.

Aggregation over Time: Holmström and Milgrom (1987) consider a situation lasting over several periods. The agent takes an action each period, resulting in an outcome with a random component. The principal cares only about the outcome aggregated over all the periods. If the incentive scheme rewards the agent differently for outcomes in different periods, either directly or indirectly, this gives the agent an opportunity to game the system to the disadvantage of the principal. For example, with a step-function scheme for the aggregate outcome, an agent who has good luck in the early periods may relax in the later periods, and one who has very bad luck in the early periods (making it unlikely that he would meet the quota for the aggregate period) may give up. If the outcome is multidimensional and the threshold in the incentive scheme covers only one easily verifiable dimension, this opens up further opportunities for gaming. Courty and Marschke (1997) find several such effects in the operation of the Job Training and Partnership Act.

Holmström and Milgrom find that linear schemes that reward outcomes in all periods alike perform well by reducing such gaming. In the limit, when time is continuous and increments to outcome are independent, so aggregate outcome is a Brownian motion whose trend is controlled by the agent's action, the optimal scheme is linear. In many applications, for example, Holmström and Milgrom (1988, 1990, 1991) and Dixit (1996, 1997), linearity is used with such a justification in the background.

Rewards, Punishments, Reputation: If action is observable with a delay, then repeated relationships allow incentive schemes with appropriately designed time-vary-

ing payments. If the agent can be punished for past actions, the threat of such punishments may be enough. But if the agent can quit, then it may be necessary to devise a cost of slackening in the form of the loss of a reward. A particularly interesting example is the *efficiency wage* scheme, for example, Shapiro and Stiglitz (1984). Consider an agent who provides a good or service whose quality is observed with a lag. Producing higher quality is more costly for the agent, so he can make more profit in the short run by degrading quality. A solution is to give him some rent each period, pay him more than the extra cost of the high quality, so long as he is not detected cheating. To eliminate his temptation to cheat, the rent should just equal the interest on the one-time profit he can make by cheating.

Repetition also helps mitigate the moral hazard on the principal's side—the temptation to renege on a promised payment to the agent. To counter this, it is not necessary that the particular relationship be repeated; it may suffice if the principal is in business for a long time or in many activities, and reputation for misbehavior on one occasion can affect his ability to attract agents to work for him later or elsewhere. Therefore this MH problem may not matter for most public sector agencies.

In AS problems, repetition creates scope for building a reputation about one's type. This can be especially important in matters like the ability of a worker or the quality of a product or service.

Career concerns: In repeated relationships, it may be unnecessary to provide explicit incentives to induce effort in the early stages; the prospect of indirect incentives in the form of a better prospect of future rewards can suffice. The basic intuition comes from Holmström (1982 b) in the context of a combination of MH and AS. A worker has a two-period career. Output is $x = t + a$, where the innate productivity type t is known to the worker and unchanged from one period to the next, but unobservable to the supervisor. The action a is taken by the worker but not observed by the supervisor. Output is observable but not verifiable. Therefore there are no explicit incentives; the worker is paid a flat wage each period. But the supervisor, and other potential employers, can use their observation of first-period output in deciding the second-period wage they will offer. Competition among employers will ensure that the second-period wage equals the rational expectation of second-period output conditioned on the observed first-period output. Since the second period is the last, the worker will not take any costly action then, so

$$w_2 = E[t|x_1] = x_1 - a_1^* = t + a_1 - a_1^*,$$

where a_1^* is the equilibrium first-period action. Even though the supervisor can correctly calculate a_1^* , the worker can affect w_2 at the margin by choosing a higher a_1 . The first-order condition for the optimum choice of a_1 is

$$C'(a_1) = \delta$$

where δ is the worker's discount factor between the two periods. Equilibrium a^* is then defined by the solution to this. Then the worker is optimizing, and simultaneously the supervisor has correct expectations. Further developments and extensions of this include Gibbons and Murphy (1992), and Dewatripont, Jewitt and Tirole (1999a, b). These consider many periods and extend the model by allowing the speed of learning about type to depend on the action. But many general intuitions of the simple model are robust. Workers at early stages of their careers will exert

effort without explicit contractual incentives (or with weak ones) to influence perceptions of their abilities. Such efforts will gradually decline as the information is revealed, so senior workers late in their careers will cash in on their reputations, and sharper explicit incentives at that stage will be needed to keep them exerting effort.

Implicit incentives are important in all organizations; they are likely to be especially important in the public sector where explicit incentives are often weak or constrained for reasons we will see.

If "career" is interpreted to mean not just tenure in a particular agency relationship but an individual's lifetime, then managers may be motivated by the possibility of rewards in the form of future employment by someone else. This has obvious implications for the possibility of collusion in regulation, which I consider later.

Ratchet effects: In a two-period AS problem, if the principal cannot bind himself to a contract for both periods, the agent will be more reluctant to reveal his information in the first period for fear that the principal will exploit this to his own advantage in the second-period contract. The principal can offer a sufficiently high rent in the first period to induce revelation, but the cost of this may be so high that he finds it better not to try to separate the types in the first period, offering instead a common or pooling contract to several types. See Laffont and Tirole (1993, chapter 9) for a full analysis.

If an additional element of MH is present, then the ratchet effect can run counter to the career concern effect for younger workers, because greater effort when young can lead the principal to infer greater ability and therefore offer less rent in the future; see Meyer and Vickers (1997). Conversely, career concerns can reverse a presumption of the MH model that greater uncertainty means weaker incentives: greater uncertainty about type, or a higher variance in the distribution of t above, leads to a greater uncertainty about the outcome for the principal, but it can cause him to offer sharper incentives because it elicits larger effort from the young in an attempt to prove their ability. See Dewatripont, Jewitt, and Tirole (1999b).

B. Multiple Dimensions

The basic theory outlined in Sections IIA and IIB considered only one-dimensional effort and information respectively. In reality such problems have multiple dimensions, which interact in complex ways. There is little general theory of many-dimensional AS problems; see Wilson (1993, part IV) for some analysis of nonlinear pricing and Laffont and Tirole (1993, pp. 184–86, 217–22) for examples in regulation. But in the moral hazard case Holmström and Milgrom (1990, 1991) have provided useful general insights.

The effect of interaction among multiple actions and outcomes on the power of incentives depends on whether the actions are substitutes or complements in the agent's cost function. In the substitutes' case, more effort in one dimension increases the marginal cost of effort in the other dimension, therefore increasing the marginal incentive payment for greater output of one task draws effort away from the other. The errors associated with the two will generally have different variances. If each outcome could be rewarded in isolation, the principal would offer more powerful incentives for the output that was a more accurate indicator of the underlying effort. But since the two must be considered together, the prospect of the agent diverting

effort away from the less accurately measured task makes the principal weaken the incentives for the more accurately measured task.

Even if the two tasks are symmetric in their costs and errors, the interaction affects the incentives. Suppose the agent's cost function for the two tasks a_1 and a_2 is

$$C(a_1, a_2) = c[(a_1)^2 + 2ka_1a_2 + (a_2)^2],$$

where $-1 < k < 1$. The tasks are substitutes if $k > 0$ and complements if $k < 0$. The outputs are

$$x_i = a_i + \varepsilon_i \quad \text{for } i = 1, 2,$$

and we look for an optimal scheme of the form

$$y(x_1, x_2) = k + m_1x_1 + m_2x_2.$$

The solution, a special case of Formula 5 in Holmström and Milgrom (1991), is

$$(4) \quad m_1 = m_2 = \frac{1}{1 + (1 + k)rcv}.$$

Comparing this to Equation 1, we see that the interaction weakens incentives in the substitutes case ($k > 0$) and strengthens them in the complements case ($k < 0$). This has useful implications when we consider a question of organizational design: How should the numerous tasks to be performed be grouped into different agencies? The paper presented at this conference by Marx and McDonald (1999) addresses some related questions.

The dimensions of effort and observables can differ. If an action has several consequences with different degrees of observability, they all can be useful in compensation schemes. The following analysis builds on Baker (1992). Suppose the effort a produces two observations,

$$x_i = a + \varepsilon_i \quad \text{for } i = 1, 2, \dots, n,$$

where the errors ε_i are independent and have variances v_i . Suppose each unit of x_2 is worth p to the principal. (Each unit of x_1 is worth 1.) Then the optimal linear scheme, a special case of Formula 4 in Dixit (1997), is

$$y(x_1, x_2) = k + m_1x_1 + m_2x_2$$

where

$$m_1 = \frac{v_2(1 + p)}{v_1 + v_2 + rcv_1v_2} \quad m_2 = \frac{v_1(1 + p)}{v_1 + v_2 + rcv_1v_2}.$$

Most interestingly, even if $p = 0$, we have $m_2 > 0$ – the observable second dimension of outcome is used for its information value even if it is intrinsically useless to the principal. This is particularly important if the first dimension is observed with a lot of error—if v_1 goes to ∞ , then m_1 goes to zero while m_2 goes to $(1 + p)/(1 + rcv_2)$, as if the second outcome were the only one but valued at the full $(1 + p)$ of both.

The usefulness of the auxiliary performance measure persists even if the agent is risk-neutral (and the enterprise cannot be sold to him for a fixed fee, perhaps because he is liquidity constrained). Thus, even if $p = 0$ and $r = 0$, we have

$$m_1 = v_2/(v_1 + v_2), \quad m_2 = v_1/(v_1 + v_2).$$

The cases of multiple actions and multiple outcomes can be combined. The agent may exert two types of effort, one producing an output that is valuable to the firm, and the other affecting an intrinsically worthless but potentially informative outcome, for example an *influence activity* that raises a supervisor's subjective evaluation of the employee. In terms of the above model, one should think of x_2 as the middle-manager's subjective report on an employee, and the employee can affect this by actions that are dysfunctional for the firm's profit x_1 . The firm's optimal incentive scheme still may include a component that depends on such a corruptible subjective evaluation for sake of the additional information it conveys. This is particularly important if the intrinsically valuable or objective performance has many complex dimensions, and the principal can take into account only a subset of these, so the rest are as if measured with infinite error variance. Then an incentive scheme that focuses on observable objective indicators will cause the agent to game the system and ignore effort in the unobservable dimensions. A subjective evaluation that can take some account of the whole picture, even if corruptible, is useful in the optimal incentive scheme.

In his paper presented at this conference, Baker (1999) considers the case with numerous unobservable actions and two outcomes. The principal cares about one, say x_1 , and the other x_2 serves as the verifiable performance measure on which the agent's compensation can be based, say

$$x_1 = \sum_{j=1}^n f_{1j}a_j + \varepsilon_1, \quad x_2 = \sum_{j=1}^n f_{2j}a_j + \varepsilon_2.$$

He shows that the usefulness of the performance measure depends on the size of the correlation between the vectors of marginal effects of the actions on the outcomes, (f_{1j}) and (f_{2j}) . This promises to be a very fruitful formulation in applications.

An agent's multiple actions for a principal may be substitutes not only for one another, but also for other actions that are of no benefit to the principal. These may include a personal business on the side or even leisure. Call the actions that benefit the principal type A actions and the others type B. The principal wants the agent to focus on type A actions, but the agent can gain by diverting some of his effort to type B. If the type A outcomes are quite accurately measurable and so can be rewarded using powerful incentive schemes, that naturally limits the agent's efforts on type B. But when type A outcomes have large errors of observation, this forces a reduction in the power of incentives on all type A outcomes, as we saw above. Then the principal may resort to even crude methods to constrain the agent, such as example limiting the amount of company time he can devote to personal matters. The optimal constraint is found by balancing the effort substitution effect against the agent's utility from the permitted type B actions, which affect his participation constraint. See Holmström and Milgrom (1991) for the analysis of this.

If the principal cares only about the aggregate outcome, and the valuation and

costs are symmetric across tasks, then the agent's substitution of effort to focus on the subset of observable tasks does not matter. In the multitask career concern model of Dewatripont, Jewitt, and Tirole (1999b), it even can be a positive advantage, because the young agent's focus on fewer tasks allows the principal to draw more accurate inference about the agent's ability, which raises the agent's second-period wage, and in turn induces him to make more effort in the first period. But if the principal's objective is strictly concave in the different dimensions of output, or if there are several principals and some of them care only about the tasks that are outside the focus, this may generate a countervailing effect against focus.

Perhaps the most common way in which giving an agent high-powered incentives based on to an easily observable outcome can lead to the neglect of a desirable but less easily observable goal is the neglect of quality in order to reduce costs or increase profits. Glaeser and Shleifer (2001) suggest an interesting way of getting around this problem. The owner or residual claimant of a profit-making firm can appropriate the benefit of quality-cutting in the form of a larger money payment, whereas the manager of a not-for-profit enterprise must take it in the form of perquisites. Since these do not generally come in a form the manager would have chosen for himself, a dollar of perquisites is worth less to the manager than a dollar of money. Therefore the manager will be less tempted to cut a dollar's worth of quality than the owner of a for-profit enterprise. In other words, setting up such an activity in a not-for-profit organization is a credible commitment to maintain higher quality.¹ Consumers will rationally figure this out, and if they value quality highly enough, will patronize the not-for-profit firm, so it can compete successfully in the market with a for-profit firm providing a similar good or service. Ways of appropriating cost-savings are even more constrained and riskier in public-sector agencies than in private-sector nonprofit enterprises, so some activities with especially severe problems of observing and rewarding quality may be usefully located in the public sector. Hart, Shleifer, and Vishny (1997), develop a related theoretical argument and apply it to the case of prisons.

C. Teams and Competition

Here one principal controls several agents. If the total outcome the principal cares about is simply the sum of the separate agents' actions, each with an independent error component, then each agent can be considered separately and the above theory applies. Otherwise, the incentive schemes for all agents must be designed together.

If the team as a whole is rewarded, then each member of it has the temptation to ride free on others' efforts. The team may be able to devise its own reward or punishment mechanism such as a social norm to overcome this. If the principal designs an incentive scheme for individual members, and there is no random component, he can achieve the first-best outcome x^* by using a step function scheme in which everyone is rewarded if the outcome is at least x^* and penalized otherwise; this

1. There are further implications of this. If the manager's valuation of perquisites is publicly observable, then the principal can do even better by appointing an austere manager who disdains the perquisites. But if that is private information, then the selection of managers will suffer from adverse selection and much of the benefit claimed by Glaeser and Shleifer can be lost.

makes everyone pivotal in providing the first-best action vector. If there is a random component, the first-best can be approximated under conditions similar to those for the case of a single agent. See Holmström (1982) for details.

Now suppose the principal's choice is restricted to linear schemes (for reasons of simplicity or nonmanipulation). If the different agent's actions are complements in the team production function, then giving one team member of the team a sharper incentive makes him take a higher action, which increases the marginal product of other members' actions, increasing their incentives too.

In MH situations, if the errors of observation in two agents' outcomes are perfectly correlated, then the first-best action is easily achieved by rewarding the agent who produces the higher output and penalizing the one who produces the lower output. Of course the constant terms in the payment schemes are adjusted to fulfill the participation constraints. If there is positive but imperfect correlation in the errors, more complicated schemes are needed. In their paper presented at this conference, Courty and Marschke (1999) show how a limited total compensation pot can be optimally allocated among multiple agents (actually multiple branches of a large agency) to sharpen their incentives.

In AS, if two firms' cost functions have a common component, then the principal can devise a scheme that gives up rents only for revealing truthfully the remaining or firm-specific component. The essential idea is to ask the two firms to report their costs C_1 , C_2 , and make the payment to Firm 1 depend on $C_2 - C_1$ and vice versa. Thus each firm is rewarded when the other reveals a high cost and penalized for revealing a high cost of its own. If collusion among the firms is not a problem, this enables the regulator to learn the common component of cost without giving up any rent; see Laffont and Tirole (1993, pp. 84–6) for details. In practice, this purpose is served by opening procurement contracts to competitive bidding, or exposing a public service provider to actual or potential outside private competition.

D. Multiple Tiers

Many principal-agent relationships are hierarchical, in which the agent at a higher tier is the principal at a lower tier. This is particularly important in the public sector; for example, a regulator serves as the agent of the legislature or the executive, but acts as the principal in dealing with the firms that are being regulated. The advantage of setting up such a hierarchical organization is that the intermediate tier can acquire expertise and thereby get some information, which should enable him to control the lower-level agent while giving up less information rent than would be the case with direct supervision by the top-level principal. But it raises the possibility of collusion between the two lower tiers. If the regulator finds out that the firm is truly low-cost and need not be given a high price, he may offer to keep silent in exchange for a bribe, or more likely the promise of a well-paid sinecure after early retirement from the public sector—a "post-career concern." The legislature can eliminate this temptation by giving the regulator just enough of the rent as a reward for reporting truthfully when he gets the signal that the firm has low cost. This in turn affects the incentive schemes used in the regulation at the lower tier. Laffont and Tirole (1993, chapters 11, 12) and Laffont (1999) develop some general theory and several examples of such regulatory politics. One general insight they offer is that collusion-proof

schemes will have weaker incentives at the lower tier; that is, they will be closer to cost-plus because powerful incentives at the lower tier will mean higher rents for firms, creating greater temptation for collusion between the firm and the regulator, in turn raising the legislature's cost of eliminating this temptation by rewarding the regulator.

E. Multiple Principals

This is the obverse of the team; many principals are simultaneously attempting to influence the actions of one agent. The principals would fare better if they got together in advance to offer a scheme that best furthered their joint interest, and bargained to split the gains among themselves according to an agreed formula. But if they are unable to do this, either because they do not share a common basis of information or because they cannot make credible commitments to share, then they may act independently. Thus we have a noncooperative game among the principals, and look for its subgame perfect Nash equilibrium in which each looks ahead and takes into account the agent's rational response to the collection of schemes offered by all the principals.

In the private sector, we often think of a firm as a top-down hierarchy, where the CEO is the principal with the team of top management as his agents, each of these managers has his own lower-tier agents, and so on. Even in this case the picture is not quite accurate—other stakeholders such as labor unions and consumer groups may intervene as separate principals at various stages. In the public sector, where outcomes of any one activity affect several people or groups, and their political differences are not fully resolved in advance, multiprincipal or common agency is the rule rather than the exception.

Bernheim and Whinston (1986) developed the general theory of common agency in the MH case. Holmström and Milgrom (1988) obtained the equilibrium of linear payment schemes with two principals, and Dixit (1996, 1997) extended this to several principals and more general cost functions and observation errors. Consider the symmetric situation where (i) the agent's efforts a_i yield outcomes $x_i = a_i + \epsilon_i$, for $i = 1, 2, \dots, n$, (ii) the principals are risk-neutral and principal i benefits only from x_i , but each principal can observe all outcomes and can make his payment schedule to the agent a function of all outcomes, not just his own x_i , (iii) the errors ϵ_i are independent with variance v , and (iv) the agent's cost function is

$$C(a_1, a_2, \dots, a_n) = (a_1)^2 + (a_2)^2 + \dots + (a_n)^2.$$

Then in the Nash equilibrium the sum of the marginal payment coefficients of all principal's incentive schemes for each type of outcome turns out to be

$$(5) \quad m = \frac{1}{1 + nrcv}.$$

Comparing this with the single-principal result Equation 1, we see that the existence of several principals makes the overall incentives for the agent much weaker. This weakening can be dramatic if n is large.

If instead the agent's cost function is

$$C(a_1, a_2, \dots, a_n) = \sum_i (a_i)^2 + k \sum_{i \neq j} a_{ij},$$

so that the agent's efforts for the different principals are substitutes if $k > 0$ and complements if $k < 0$, then the aggregate marginal incentive coefficient for each outcome type becomes²

$$m = \frac{1}{1 + nrcv[1 + (n - 1)k]}.$$

Thus we get a further weakening of incentives in the substitutes case, but an offsetting strengthening effect in the complements case. This suggests a principle for organizational design: When possible, agencies should be organized to group together complementary activities, and grouping of substitute activities should be avoided.

The reason for weakness of the overall incentives facing an agent of multiple principals is that each principal offers a positive coefficient on the dimension of output that concerns him and negative coefficients on the other dimensions; the result when all principals' schemes are added together is a weak positive coefficient on each dimension. Each principal wants to divert the agent's effort to his dimension and away from the other dimensions; that is why the weakening is most severe when the efforts are substitutes. We see this in practice when the Congress threatens to reduce the funding of an agency that is putting more effort in the dimension that interests some other principals, such as when the National Endowment for the Arts supports the kind of work that artists and art critics like. If a principal's dimension is hard to observe and therefore not amenable to linear or other smooth incentives, that principal may resort to imposing crude constraints on the agent's actions.

Once we understand the reason, we see a way to eliminate the effect. The information can be compartmentalized so that each principal sees only his outcome, or a legal stipulation requires that the payment schedule of each principal can be a function only of his own x_i . Then each must use strong incentives to attract the agent's effort. This leads to stronger incentives; for example, if the agent's cost does not have any cross-terms in efforts, the n disappears from the denominator in Equation 5, so the marginal bonus coefficient in the Nash equilibrium is the same as that with unified principals. However, compartmentalization may be impracticable in an open political system or when the principals are top-level players such as the legislature or the executive whose actions cannot be restrained by an outside force.

Multiprincipal agencies with AS were first studied by Martimort (1992) and Stole (1991). These situations also involve externalities among the principals, because one principal's rent-sharing scheme affects the agent's incentives to reveal the truth to the other and therefore the rent-sharing scheme the other must use. The result is that incentives are weaker in the noncooperative equilibrium than with cooperation between the principals when the agent's actions are substitutes (and stronger when they are complements). Thus the overall effect for AS is similar to that for MH. There are several additional technical issues, for which the interested reader is referred to Martimort and Stole (1997) and Peters (1999).

2. We have $1 + (n - 1)k > 0$ for the cost function to be convex.

IV. Special Features of the Public Sector

To see how the general theory of incentives sketched in the previous sections relates to the practice in the public sector, it is useful to start with some broad features of government agencies and bureaucracies, and observe how they differ from firms and other organizations in the private sector of the economy for which the theory was initially developed. Some of these features and differences were alluded to in the course of the statement of the theory, but here I collect them into a somewhat more systematic whole. Of course many differences between public and private sector organizations are ones of degree, not kind. Also, the public sector is large, complex, and diverse; most of the points below apply only partially to any one agency and not at all to some. But each feature has relevance for many of them, and it is worthwhile to list the features explicitly.

With the same provisos, we can divide government agencies into two types depending on their functions: agencies that provide services to the public—such as garbage collection, mail delivery, some forms of transportation, education, health-care etc—and those that coerce resources or actions from the public—such as taxation, regulation, law enforcement, conscription. Again, in reality we have mixtures; for example, driving licenses are both a service and an instrument of enforcement, and health inspection of restaurants provides a service to potential customers by carrying out enforcement on the restaurateurs.

A. *Multiple Principals*

The actions of any one government bureaucracy or service agency usually affect several people who are in a position to influence it as principals. Many government services have features of public goods—jointness and nonexcludability—to some degree. Even without publicness, there are externalities: Aspects of the services provided to one person give utility or disutility to others. For example, better care provided for people suffering from infectious diseases benefits even those who are not currently sick; and people get utility from high-quality healthcare not merely because they may themselves need it one day, but because of their ethical concern for others or because they take civic pride in belonging to such a country. Finally, many public services do not charge the direct users for the full cost, but are subsidized partly or wholly from tax revenue. Then all taxpayers are affected by choices that affect the costs of these services.

People care not only about the outcomes of government agencies but also about some of the input and the methods of production, most notably about employment, and incomes in particular regions or communities. Thus there is no clear separation between ends and means.³ Labor unions are an important stakeholder or principal in many government agencies, and they care about various aspects of the inputs or means such as working conditions, and even about the incentive schemes themselves

3. The theory of incentives was developed, and was presented above, making a distinction between actions and outcomes, but in the multidimensional version there is no reason why the actions themselves, possibly with some error of observation, should not be components of the outcome vector, so this case is covered by the theory.

as they affect the incomes of their median members. And many citizens feel strongly about the methods used by law-enforcement agencies in combating crime.

More generally, some of the agents whose behavior the policy or the bureaucracy is trying to influence are themselves principals in the prior political game that set the rules of the subsequent policy implementation or regulation game. They are selectively interested in specific dimensions of the outcomes and inputs.

Outcomes of private firms' actions also affect many people, but in principle the owners' interest is paramount, and can be reduced to a single or scalar bottom line like quarterly profit or share price. Similarly, all the interests affected by a public agency's actions and outcomes could engage in advance political bargaining and collapse all the dimensions into a single evaluation function (which does not have to be linear, unlike the profit of a private firm). This could then be the basis for presenting a jointly agreed incentive scheme to the agency. Sometimes that is done; for example, questions such as what age and how many years of contribution makes one eligible to receive social security benefits, how much those benefits should be, and how they should be indexed to inflation are intensely political questions but they are resolved in Congress, and the Social Security Administration's job is merely to apply the criteria and send out the checks in correct amounts and on time. However, this is an exception; most often all affected interests retain and use the freedom to exercise their influence directly on the agency. As Wilson (1989, pp. 299–300) puts it, "Policy making in the United States is like a barroom brawl: Anybody can join in, the combatants fight all comers and sometimes change sides, no referee is in charge, and the fight lasts not for a fixed number of rounds but indefinitely. . . . It's never over." In other words, government agencies are common agencies with several principals who are engaged in a noncooperative game to influence their actions.

In principle, all citizens have an interest in the making and administration of public policy. If they were all active participants, then under certain conditions the political process would produce an optimal outcome (subject to the usual constraints of resource availability, technology, and information). The idea that participation by all factions in the political process would lead to socially optimal outcomes can be traced back to Madison's famous tenth Federalist Paper. More recent statements include Wittman (1995) and Grossman and Helpman (1994). But quite apart from the difficulty of meeting the requisite conditions, in practice not all people or groups have equal resources or information or ability to participate. The educated and the informed vote more often; the wealthy and the small groups who can solve free rider problems for concentrated benefits lobby more often. This results in biases that then create broad public dissatisfaction with the outcomes of government agencies and activities.

B. Multiple Tasks

Most government agencies perform several tasks. Even seemingly clear matters like mail delivery have many dimensions—including the prices of various services (and costs if there is a subsidy), average and extremes of the distribution of delivery time, cleanliness of post offices, courtesy and efficiency of the postal clerks. And, as mentioned above, the tradeoffs among these dimensions are not clarified in advance. In many other agencies matters are even more complicated.

Sometimes the Congress or the Executive simply assigns a new task to a plausible existing agency without much thought about the interaction. For example, Wilson (1989, p. 100) describes the problems that arose when the Social Security Administration was asked to handle the Disability Insurance and Supplemental Security Income programs, where the agency had to make difficult decisions about eligibility.

Many dimensions of goals are left so vague that the agency and its political superiors alike would find it difficult to say what constitutes their fulfillment, whether before or after the fact. For example, the U.S. Department of State is expected to "[P]romote the long-range security and well-being of the United States"; Wilson (1989, pp. 32–33) offers other examples. Ambiguity exists even in economic agencies. For example, patent examiners are paid in part through bonuses for "disposal" of patent cases. Issuing a patent always disposes the case as far as the patent office is concerned (although the matter may resurface in courts), but denying a patent may keep the case alive as the applicant amends or appeals the decision. This can result in too many patents being issued; see *The Economist* (2000).

The theory of incentives generally assumes that actions are unverifiable but outcomes are verifiable. In practice sometimes exactly the opposite is the case. It is very difficult and controversial for the Occupational Safety and Health Administration's managers or the outside public to judge whether the vague ultimate goals of safety and health were furthered; it is easier to verify that regulations requiring labels on ladders were promulgated. Wilson (1989, p. 163) calls such agencies procedural organizations, and points out that they will function using standard operating procedures that pertain to the observable actions instead of the performance-based incentives that are familiar in economic theory. He contrasts them with craft organizations where outcomes are observable but actions are not.⁴ These are the primary loci for applicability of incentive theory, although even some principals may care about some of the input directly and attempt to influence their choice. The same organization may have different characteristics in different situations; an army is procedural during peacetime preparations but becomes a craft organization when war starts and its "fog" descends.

The toughest case in Wilson's classification is the one where neither outcomes nor actions are at all accurately observable; he calls these coping organizations. The theory says that in such agencies the explicit incentives must be very weak. If outcomes are observable to the principal but not verifiable and contractible, there can be implicit incentives like career concerns. Several agencies in the public sector belong to, or are close to, this category. Wilson argues that in coping agencies there will be much conflict between management and lower-tier "operators." The management will focus on the more easily observable dimensions and deny the operators much freedom of action; the operators will engage in the immediate tasks they regard as essential while keeping the management satisfied about its focus. If such an organization is answerable to multiple external principals, this conflict is replicated at a higher level of agency.

4. Confusingly, he uses the term "output" for what economists would call "action" or "effort"; thus he says, "Outputs consist of the work the agency does. . . . Outcomes can be thought of as the results of agency work." (1989, p. 158)

C. Lack of Competition

In the private sector, each profit-seeking firm gets powerful external incentives from its competition with other firms. However, most public or quasi-public (regulated) service agencies used to be monopolies. Many of the perceived ills of these agencies, most notably the high cost and poor quality of the products and lack of attention to consumer preferences, were thought to be due to the lack of competition and consequent weakness of incentives. In recent years many of these activities—postal and telecommunication services and rail and air transport in many countries, and health-care and schools in several—either have been privatized, or have mixed arrangements where public agencies providing them coexist and compete with private firms. Experience of these privatizations has been mixed. Cost savings have been achieved in some instances and not in others; in some cases there has been a deterioration of quality. Most enforcement agencies remain monopolies in the public sector, but private security forces exist, public police forces in one locality provide services to neighboring ones, and there are instances of prisons run by private firms under contract to the government.

More generally, even if the users of a service obtain it from the government and do not pay for its use in full or at all, the question of whether it should be produced by an agency owned and operated by the government, or produced privately and merely procured by the government, is a distinct one, and should be answered by considering and balancing the costs and benefits. Market competition can provide sharper incentives. But exposing a public agency to competition, or privatizing the activity completely, does not always work. In a service with multiple dimensions of which only some are observable and subject to the discipline of consumer choice, profit-making firms may focus on the marketable dimensions and ignore others such as safety and some aspects of quality. Of course a public agency has its own problems with multiple dimensions. Also, the multiple principals who are not direct payers but are concerned about various aspects of the service may find private firms unresponsive. They will then exert political pressure to regulate or constrain the firms, which may find it difficult to operate under these constraints. Their costs may increase, some may drop out, reducing competition, and the industry may end up looking just like public agencies that happen to be privately owned. And since most public agencies provide services that require contact with their clients, there is almost no import competition of the kind that can play an important part in disciplining even large private firms that produce goods and internationally tradable services like banking.

D. Motivated Agents

The general theory of incentives assumes that an agent gets utility solely from the money income the principal pays him, and disutility from the effort he exerts on behalf of the principal. In reality, agents may get utility from some aspects of the task itself. If they get utility from the mere fact of working in this organization, the principal can pay them a lower salary and still meet their participation constraint. If they get utility from the actions they take in this job, then the principal can offer smaller marginal bonus payments and still secure the same level of effort. Both these

effects are more likely to arise in public sector agencies than in private firms, and may be of particular advantage in government agencies that are budget-constrained.

An important reason why agents in a public sector agency get utility from working there or from their actions is that they share some idealistic or ethical purpose served by the agency. This can result in mutually beneficial endogenous matching of workers and agencies, especially in the formative period of a new agency. That in turn can define the organizational culture of the agency for a long time; see Wilson (1989, pp. 64–68) for examples and a discussion. However, in some agencies the idealistic motive of its frontline workers can conflict with the objectives of its middle management; for example, Heckman, Smith, and Taber (1996) found that case workers in JTPA training centers were motivated to help the least well-off, even though this gave their center a worse placement record, and reduced the performance payments it received. Perhaps the top-level managers should have devised an incentive scheme, of the kind outlined in Section IIB above, to induce truthful revelation of information by the case workers.

Another nonmonetary factor motivating agents is professionalism. Wilson (1989, p. 60) defines a professional as “someone who receives important occupational rewards from a reference group whose membership is limited to people who have undergone specialized formal education and have accepted the group-defined code of proper conduct.” This definition is quite broad and can encompass “company spirit” in private firms; Japanese firms actively cultivate it, and U.S. firms used to. But I suspect that a “group-defined code of proper conduct” is more likely to attract adherence and yield occupational rewards if the ultimate purpose of the group is idealistic than if it is purely materialistic.

Professionalism goes naturally together with career concerns, and therefore can be fostered by implicit incentives of the kind a public agency lacking the ability to offer powerful direct ones must rely on. Dewatripont, Jewitt, and Tirole (1999b) construct a formal model of this, and show that career concerns work best in eliciting effort if the agency has a mission focused on a narrow and clear set of tasks. Professionals in such situations can be given more autonomy, which also gives them a sense of control or stake in their work; this can further improve their motivation and therefore elicit even better effort. However, given the earlier observations about the multiplicity and vagueness of tasks and outcomes in many public agencies, and the need of multiple principals to impose constraints, recourse to autonomous professionals may be limited in its scope.

E. Consequences

The extension of the theory of agency to multiple dimensions and multiple principals has revealed important interactions among the outcomes, actions, and principals. We saw that incentives will be generally weaker in these situations than in the simple case of one outcome and one principal. The weakening is most dramatic if the various tasks are substitutes in the agent’s cost function, and if the number of principals is large. Many effects of the interactions and the weak incentives can be found in practice; now we can better relate them to the theory.

First, in their day-to-day operations, agencies will think not in terms of the multiple and vague ultimate goals, but in terms of a smaller number of immediate and measur-

able tasks that, while they may be essential for an ultimate achievement of the goals, seem quite disconnected. Wilson (1989, chapter 3) emphasizes and illustrates this distinction in practice. If an organization has an internally agreed and clear critical task, he says that it has a sense of mission. Combined with professionalism, it gives the workers a feeling of special worth; see Wilson (1989, pp. 26, 95). This in turn may ameliorate the problem of weak overt incentives, and also reduce the budgetary costs of agency. But there is a tradeoff: Focus on a narrow set of tasks means neglect of others that matter to some principals. It also will cause the agency to resist the assignment of new tasks if they do not fit into its self-defined mission; see Wilson (1989, p. 222). This is not general conservatism; agencies are receptive to new and better ways of performing their mission, or new tasks that support or complement the mission.

When they think in terms of the ultimate goals, agencies will tend to focus on the better-observable dimensions. One particular effect of this can be an emphasis on equity as compared to efficiency, because the former is often more accurately observable. For example, it is easy to demonstrate that all pupils in a school are being treated equally, but whether they are all being educated well is much vaguer, harder, and more controversial to prove; see Wilson (1989, p. 132).

Of course the principals who care about outcomes in the less accurately observable dimensions do not passively accept the neglect of their concerns. As we saw above, when they cannot offer powerful outcome-based incentives at the margin, they have to resort to cruder constraints that require the agent to limit the diversion of effort to other dimensions, or what amounts to the same thing, ensure that the agent devotes a stipulated minimum amount of time to their concerns. When this is being done in several dimensions by several principals, the result is micromanagement of the agency. Wilson (1989, chapter 7 and pp. 241–44, 366–67 and elsewhere) demonstrates and discusses this phenomenon. Constraints also can arise as a way of coping with the problem of costly influence activities in hierarchical agencies. When there is risk of collusion among the lower tiers, limiting the discretion of the middle-level principal-cum-agent may be a good way to eliminate the lower-level agent's temptation to engage in influence activities instead of productive ones; see Milgrom (1988), Milgrom and Roberts (1988).

Agencies and observers alike complain about micromanagement, but the theory tells us that it may be an unavoidable consequence of, or a less costly way of coping with, the asymmetric observability of multiple outcomes affecting multiple principals. To quote Wilson (1995, p. xx) again: "Back in the late 1940s . . . we were told that America had a pluralist system in which almost everybody was represented. It wasn't true. Today it is. So now we say we have gridlock."

I have argued that public sector agencies are answerable to several principals, and perform multiple (usually substitute) tasks. The theory of Section III showed that these features cause weakness of incentives, both in MH and AS situations. That in turn has implications for the workforce of these agencies in equilibrium. If the alternative to public sector employment is employment or entrepreneurship in the private sector, where marginal incentives are more powerful, then those people who are less averse to effort or risk, or have higher ability, will get higher rents in the private sector and prefer to work there (so long as any specific components of ability in the two sectors are not strongly negatively correlated). This conforms to the popular

impression that public-sector bureaucrats are mediocre, and choose safety over creativity or venture. A way around this problem may be to create a spirit of idealism or professionalism that will attract a more able and venturesome pool of people; the civil services in France and Britain do this to some extent, perhaps aided by post-career concerns. However, the social optimality of moving top talent from the private to the public sector is not self-evident.

If public sector agencies face all these difficulties, is privatization the answer? The last two decades have seen a wave of privatization of state-owned enterprises, such as in power generation, metal and mining firms, railways and airlines, banks, and post and telephone services. Megginson and Netter (2001) have surveyed the theory and empirical evidence on this, and find that the private firms are generally more efficient than their state-owned predecessors. In all these cases the enterprises produce goods and services that are close to the “private good” end of the spectrum; that is, they are excludable and rival. Therefore the case for keeping these activities in the private sector is most compelling. Even then there are difficulties. Privatization does not necessarily induce competition, and a private monopoly may have inefficiencies similar to those of a government enterprise. A profit objective, and even competitive discipline, may lead to neglect of unobservable quality. And in the political arena, efficiency is not the only consideration. Stakeholders are affected by distributional concerns, most notably employment and wages, which may suffer as a result of privatization. Agencies that provide goods or services which are closer to being public goods, or generate stronger externalities, also have stakeholders with more diverse interests, and therefore are even harder to privatize.

The last point shows that in political economy, whether an activity is carried out in the public sector or the private sector is itself endogenous, responding to the differences of technologies of carrying out the necessary political transactions, namely coping with information asymmetries, making credible commitments, and enforcing contracts. The idea that “[t]ransactions, which differ in their attributes, are aligned with governance structures, which differ in their cost and competence” was developed by Williamson (1996, pp. 12, 46–47), who labeled it the *discriminating alignment hypothesis*. He has recently (1998) extended this idea to examine when transaction costs are lower for a public sector agency than for a private sector enterprise attempting to provide an identical service. The division of agencies we actually observe between the two sectors need not always be optimal in this sense. However, when we observe and criticize an apparent inefficiency in a public-sector agency, we should at least pause to examine whether a private-sector firm could do a better job, given its attendant difficulties of multiple outcomes—many of which are poorly measured and whose relative valuations have not been agreed among competing interests. We also should realize that forced privatization based on purely efficiency considerations may not work because of resistance from affected stakeholders. If these special interests cannot be defeated in the political arena, they must be compensated.

V. Cases and Empirical Studies

In this section I will examine some specific issues and organizations in the human capital area, from the perspectives developed in the previous sections.

My purpose is to interpret some existing case studies and empirical research in the light of the theory, and thereby suggest some further research and occasionally some policy conclusions. I have selected a variety of situations that illustrate different points but also have some common themes that follow from the general discussion of public sector agencies in Section IV.

A. Education

The general issue of public policy for education, and specific questions of how to reorganize public school teaching and administration to improve educational quality, are perennial items on the political agenda, and have generated a huge amount of academic research and writing. I will base my analysis on just one recent book, Hanushek and Jorgenson (eds. 1996), but the papers in this book contain surveys and discussions of much previous work. I begin with a few prominent characteristics of the public school education that I have culled from the papers in this book. All those listed in Section IV are present.

Multiple Goals: Several national commissions and policy analysts have listed numerous goals for public education. Organized somewhat differently and in no necessary order of importance, these include: (1) imparting basic skills of literacy, mathematics and science for communication, reasoning, and calculation; (2) fostering the emotional and physical growth of children; (3) preparing students for work by teaching them vocational skills and attitudes suitable for employment; (4) preparing them for life by teaching them skills of health and financial management; (5) preparing them for society by instilling ideals of citizenship and responsibility; (6) helping them overcome disadvantageous circumstances at home, including in many cases poor nutrition and poor study environments; and (7) providing an environment free from drugs and violence. These goals are not by any means mutually contradictory but, given the finite resources of schools and teachers, they must compete for attention and therefore be substitutes to a considerable extent in the schools' production process. Moreover, teaching various skills to the most able students may conflict with teaching the same things to the least able ones in the same classroom. The goals are not precisely measurable; even where tests of achievement exist, interpretation of them and their results is often controversial. Different goals are measured with very different accuracy and different time lags. And even if the students' final achievement can be measured, another difficult process of inference is needed to figure out how much of it was the students' innate ability and how much the schools' "value added."

Multiple Principals: The system has several "stakeholders" who act as external principals in the agency relationship that is played out in the political arena. These include (1) parents and children, (2) teachers and their unions, (3) taxpayers at the local and national levels, (4) potential employers of the graduates, (5) society as a whole, (6) private schools, and (7) groups favoring or opposing specific items of content in the curriculum. These groups have very diverse preferences and emphases about the multiple goals. Parents want a mixture of some vaguely defined "good education" (which may differ according to their children's abilities) and daycare; teachers and their unions want higher pay, better working conditions including small class sizes, and access to programs for improvement of their professional skills and

subsequent salary rewards for participating in these; taxpayers want low costs; employers want vocational skills; society as a whole wants good citizens; and private schools compete for pupils and some public funding.

Multiple Periods: Teachers have long careers, during which their skills develop and are revealed. Therefore career concerns can be more important than incentives based on short-run performance, even if the latter can be measured with sufficient accuracy.

Lack of Competition: Private schools, especially parochial ones, do compete with public schools. There is also some choice at the local level, for example magnet schools. Voucher programs are creating more competition. But for the vast majority of the population, the local public school remains the monopoly provider.

Motivated Agents: Many people enter the teaching profession for idealistic reasons or because they enjoy working with children.

To sum up, the system of public school education is a multitask, multiprincipal, multiperiod, near-monopoly organization with vague and poorly observable goals. This goes a long way toward explaining the disagreements over its problems and the inefficacy of the single-minded solutions that have been tried. Several papers presented at this conference, and in particular Eberts, Hollenbeck, and Stone (1999), and Ballou and Podgursky (1999), examine in detail the aspects involving teachers and their unions.

The problem at the root of much of the policy debate about education is the poor performance of U.S. students on standardized tests, especially in international comparisons; see Hanushek (1996, pp. 35–7). Even this finding is not uncontested; thus Smith, Scoll, and Link (1996, p. 16) say that the fact that Japanese students score better than U.S. ones on algebra tests in the eighth grade is simply because “in Japan most students take algebra in the seventh grade” but “in most cities in the United States . . . we do not let our students take algebra in the seventh grade.” (Of course this begs the question “Why not?”) Experience with attempted solutions is generally poor; for example, increased expenditures (Hanushek 1996, pp. 33–7), smaller class sizes (ibid, p. 38), requiring teachers to have advanced degrees (ibid, p. 38), and greater decentralization of school management (Summers and Johnson, 1996) are all found to have negligible or insignificant effect on student performance. These studies are criticized by Smith, Scoll, and Link (1996, pp. 21–24) for using inappropriate measures of performance. This is to be expected given the disagreements of different principals about the goals, but the preferred solution of Smith et al., namely “an assessment device that is designed to measure what is being taught,” (ibid, p. 24) can degenerate into a tautological approval of the existing system or one that teachers or their unions find the most convenient. Bishop’s (1996, p. 125) suggestion of following the system used in many other countries, where students’ learning is assessed not through aptitude tests but through curriculum-based examinations that are set and graded at a national or regional level rather than by the teachers themselves, may cope with this problem.

There is a large empirical literature on the effects of various reforms and reorganizations, but it yields conflicting and unclear results. Eberts, Hollenbeck, and Stone (1999) find that merit pay does not raise average student achievement, and unionization does not lower it, although unionization may be detrimental to students at either tail of the spectrum of achievement. Ballou and Podgursky (1999) are more critical

of unionization: They find that seniority-based pay schemes are better explained as outcomes of rent-seeking behavior by teachers' unions than as efficient incentive schedules. Eberts et al. do not expect that exposing public schools to competition from charter schools or voucher systems would improve student outcomes; however, Hoxby (1999) finds that school choice can fundamentally change the teaching profession by increasing the demand for teachers with higher qualifications and motivation, and more math and science skills. Eberts et al. instead favor team-based incentives—school-building performance awards.

Smith, Scoll, and Link (1996, p. 21) argue that reorganization “conducted with clarity of purpose” can be successful, but that is to deny the multiprincipal nature of the problem that precludes clarity. Parental choice, using vouchers or similar programs, creates the strong incentives of the market but, caters to the preferences of only one of the many political principals. Bishop (1996, pp. 134–35) reports some encouraging effects in international comparisons but I have not found studies that look at all relevant dimensions. The reality of the opposition of one important group of stakeholders, namely teachers' unions, must be taken into account, because they are in a position to sabotage the attempted reform.

Hannaway (1996, p. 103) clearly recognizes the multidimension, multiprincipal nature of the problem. She also emphasizes that outcomes are at best very imprecisely observable: “Defining and agreeing on goals in education is one problem; measuring progress toward these goals is even more difficult.” This leads her to conclude that explicit performance-based incentives by themselves will not succeed. She also argues that another often-advocated remedy, school-based management or decentralization, also is unlikely to be effective by itself, partly because teachers have their own different priorities about reforms—they focus on problems of student behavior and school facilities instead of the content and quality of teaching—and partly because parents, especially in low socioeconomic status areas, are too busy or apathetic or free-riders and therefore inactive in local decision-making and oversight. She suggests that a combination of decentralization and incentives will work: Observability is better at the local level so performance-based incentives will have fewer problems of weakness and multidimensional substitution, and the existence of objective explicit incentives will reduce the need for active and costly oversight. But such a system will create a new problem: It will be a hierarchical agency, in which the lower tier agents (teachers) can collude with the intermediate-tier principals-cum-agents (school principals and parents). This will bias the results toward dimensions that matter more to these groups—working conditions, daycare aspects of school etc.—and other stakeholders in society such as employers will have to devise other ways to offer incentives or impose constraints on this coalition. It is not immediately clear that the net result will be beneficial.

Hannaway is clearly right in one important respect—successful reform must be systemic and multidimensional if it is to cope with the multiple dimensions of the problem. Hanushek (1996, pp. 42–3) also emphasizes that “many different approaches might be used simultaneously,” although he stresses performance incentives more than do some others. I think that our understanding of the issues can be improved by trying to think of the education system in terms of Wilson's (1989, p. 159) classification that was given above in Section IV.B. The outcomes are multidimensional and hard to measure; some dimensions of the inputs are easy to verify.

Therefore the school system is somewhere between being a “procedural” and a “coping” organization. We should expect to see weak explicit incentives, many constraints, and evaluation by evidence that the rules were followed. We should not expect to turn it into a craft organization that is left free to devise its own best procedures and judged by the outcomes.

B. JTPA

The Job Training Partnership Act (JTPA) of 1982 aims to provide training to the disadvantaged to improve their employment prospects. The training is provided in more than 600 independent centers, whose funding includes performance-based incentives. James Heckman and his students and coworkers have carried out several detailed empirical studies of the operation of this system. Their findings link well with the general theoretical considerations of Sections II and III.

The system is a multitier agency. The management of each center is proximately an agent of the Department of Labor, and eventually of the Congress and the public. The individual case workers are agents of the managers of their centers. The objectives of these parties differ. The stated aim of the act is to improve the employment prospects and earnings of the disadvantaged. The system does focus on the disadvantaged by limiting eligibility essentially to people in families below the poverty line or in unemployment.⁵ But the program is not an entitlement; centers have some discretion to vary local eligibility requirements, and case workers have discretion in accepting applicants into the program and deciding what training services to provide to each accepted applicant. More importantly, the stated aim pertains to the “value added” by the center’s training but, as this is difficult to measure, the actual performance measures are gross concepts, namely the employment status and earnings after completion of the training, irrespective of whether the training contributed to the outcome or the trainees already had attributes conducive to good employment prospects at entry. As a result the managers of the center have an incentive to select such applicants and turn down those whose employment prospects look hopeless. But the front-line case workers who do the selection have different objectives. Heckman, Smith, and Taber (1996) use detailed data from one center to infer the case-workers’ objectives from their actions, and find that they “have a marked preference for admitting the least employable applicants.” The fact that the incentive payments go to the center as a whole, and cannot be used to pay higher salaries or bonuses to individual workers, may facilitate this behavior. Ironically, the case-workers’ preferences may be closer to those of the top-level principals—the Congress and the public—in their focus on helping the most disadvantaged; therefore the behavior may serve as a good counter to the adverse incentives created for the middle-tier principals—the center managers—by the gross outcome-based incentive scheme.

At a more detailed level, the implementation of the gross performance measure creates further problems, namely incentives for gaming. An accepted applicant starts training immediately. The center decides each applicant’s training program, and “terminates” the trainee upon its completion. The trained person then enters the

5. This is a very rough statement; for more precise and detailed descriptions, see Heckman, Smith and Taber (1996), and Courty and Marschke (1997). The same caveat applies to what follows.

job market (with some help and counseling from the center), and the center can report the job market outcome at any date between termination and three months thereafter. Two dimensions of outcomes are reported: employment status and wage. On June 30 of each year, all outcomes reported by the center in the preceding 12 months are averaged, and the center gets a performance payment if this average exceeds a set standard.

The theory of Section III.A tells us what to expect, and Courty and Marschke (1997) provide detailed evidence of just such behavior. The center has a 90-day option on the reporting date. Therefore it will report very good outcomes immediately, and wait on the others in the hope of improvement. This option will be most valuable (and therefore most carefully exercised) for the most volatile aspect, namely the employment status. The threshold incentive scheme creates further gaming. In June of each year, if the center is safely exceeding the standard or if it is so hopelessly behind that it has no hope of meeting the standard, it will report its bad outcomes at once to clear the decks and improve its prospects of meeting the standard for the following year.

The Department of Labor did try to modify the incentive scheme to remove some aspects of gaming; it required a follow-up report on the employment status precisely three months after the completion of training. The centers modified their behavior just enough to meet this. They provided special services for the follow-up period, such as transportation and childcare allowances and further job search help if the person lost the initial job, but nothing thereafter; see Courty and Marschke (1997, p. 387). This illustrates how incentives that focus on one of the many dimensions of an outcome bias the actions of the agent.

VI. Suggestions for Reform

My overarching perspective can be described as “political economy”; I view public-sector agencies not as top-down hierarchies where a single principal can design and enforce an incentive mechanism, but as multiprincipal agencies that must respond to the influences exerted by many stakeholders with widely different interests. This makes it difficult to offer recommendations for reform: To succeed, any change must operate through the political process and change the politico-economic equilibrium. Opportunities to do so arise infrequently, usually only if the current condition is generally perceived to be one of crisis. Also, our conceptual understanding and interpretation of empirical observations is incomplete and controversial; therefore any recommendations must be tentative and cautious. With all these provisos, here are a few thoughts.

Perhaps the most important consequences of the multidimension, multiprincipal nature of the problem are the unforeseen and dysfunctional side-effects of policies. Most incentive schemes are designed to focus on the few dimensions thought of by the policymaker. But the agents respond by changing their activities in all dimensions, and the effects on the other dimensions affect some other principals or stakeholders adversely. We have seen examples of this in school testing, and in case termination decisions in JTPA; readers can readily think of numerous other instances in other agencies. While there is no sure remedy, a small reform may help a lot.

Every government agency should have a small group of “devil’s advocates” whose sole job is to determine how any policies promulgated by this agency can be misused or manipulated, often in conjunction with some other policy that exists for some other reason. (The most prominent examples are in tax law—two or more provisions of the tax code can be “arbitraged” by taxpayers to greatly reduce their tax obligations without serving the incentive aims of the separate taxes.)

More generally, policy design must pay attention to the complex interaction among multiple tasks and principals. In other words, the organization must be viewed as a whole in a “general equilibrium” manner. Identifying problems and seeking solutions one at a time is likely to create opportunities for the agency’s workers, managers, and clients to game the system to their advantage. These considerations also mean that one must accept some weakness or imperfection of incentives: for example, use linear schemes instead of step-functions, and more generally be content with the second or third best.

There are some implications for organization design, that is, for the question of which tasks should be grouped together and undertaken by one organization. Broadly speaking, this depends on whether the tasks are substitutes or complements. If complementary tasks are grouped together, incentives for one reinforce those for others and more powerful incentives can be given. If substitute tasks are grouped together, incentives must be weak all round in order to reduce undesirable substitution away from some tasks. Mutually substitute activities are better carried out in separate agencies, when more powerful incentives come from yardstick competition or relative performance-based evaluation.

Finally, the difficulty of offering powerful direct incentives and the importance of indirect incentives such as career concerns and intrinsic motivation, is probably well understood by practitioners, but merits restatement and emphasis.

VII. Suggestions for Research

My conclusions for future research in this area are more definite and positive. Researchers should be encouraged by the fact that while the simplest, first-pass theory of Section II does not give an adequate understanding of reality, the later richer theory of Section III, which pays attention to the important features of reality like multiple dimensions and multiple principals, does give useful insights. Of course, much more remains to be done; future theoretical work in this area should focus on specific contexts and do justice to the richness of detail in particular cases. The most prominent instances of this kind come from the fact that beautiful general theory exists that corresponds well with practical problems, but the theory has not been applied in specific ways to offer solutions. For example, the theory of optimal mechanisms to elicit an agent’s information, which was sketched in Section II.B, can be used to calculate the specific rewards for school principals to reveal information that may improve school efficiency at the cost of their staffing and budgets, or rewards for case workers in JTPA (who are inclined to select applicants who are initially more disadvantaged) to reveal which applicants will get more value added from the training. Similarly, the theory of career concerns in Section III.A can be applied to design better wage profiles for teachers. (Of course whether this will get

past the political resistance of the teachers' unions is doubtful.) And the theory of auditing mentioned in Section II.C should find many ready applications.

Empirical research should not seek sweeping universal findings of success or failure of performance-based incentives or privatization, but should try to relate success or failure to specific characteristics like multiple dimensions and principals, observability of outputs and inputs, and so on. Empirical research also needs care in handling endogeneity and various biases in sample selection.

If the level of communication and convergence of thinking among theorists, empirical researchers, and practitioners that was evident at this conference is any indication, the future of research in this area is promising indeed.

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