Identity, Incentives, and Their Dynamics in the Production of Publicly Provided Goods*

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Abstract

This paper aims to clarify the role of government provision of valuable goods and services when (i) workers may be intrinsically motivated to exert effort and (ii) there are constraints on how production occurs. We analyze the optimal organization of production in a model where agents’ preferences have a behavioral component and where some decisions are made by a central authority and others are made at a lower, decentralized level. In this framework we show that it may be optimal for the central authority to choose a relatively inefficient monitoring technology and to reduce monetary incentives. The mechanism driving this result is related to a general equilibrium effect as mediated by the public administration budget constraint and the firm’s own composition of workers.

Keywords: Identity, Incentives, Public Goods Provision, Public Service Motivation, Decentralized Production.

JEL Classification Numbers: L30, M50, Z18.

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1 Introduction

A wide and growing literature in economics focuses on the presumption that pecuniary remuneration is not the only kind of reward that individuals pursue; in particular, the internalization of social norms and moral values can act as negative and positive sources of individual utility (Kaplow and Shavell, 2007; Sliwka, 2007; Bisin and Verdier, 2008; Tabellini, 2008). It has been observed that, in many social situations and economic transactions, the behavior of individuals is affected not only by the material gains they can secure but also by the internalization of norms (of good conduct) whose observance yields positive utility. Such norms lead people to refrain from stealing, cheating, or shirking their duties—even when refraining is not in their immediate material self-interest. The evidence on this phenomenon is so wide that it has led some authors to argue that “the real question is no longer whether many people have other-regarding preferences, but under which conditions these preferences have important economic and social effects” (Fehr and Schmidt, 2006, p. 618).

Some works have documented and analyzed the implications of prosocial motivation among public organizations’ workers (i.e., their predisposition to exert high levels of effort and/or behave according to their employer’s objectives when executing their tasks) for the public provision of social goods and services.\(^1\) Workers and managers with such intrinsic motivation give public organizations a comparative advantage over any private firm (whose members are presumably less unselfish and/or more profit oriented), which helps preserve the public organization’s relevance to the provision of social goods and services—especially given that many social services are traditionally provided by the government (Francois and Vlassopoulos, 2008). Thus one consequence of prosocial motivations among public organization employees is that government intervention in the economy may be justified from a welfare economics perspective and from an improved productive efficiency perspective.

This paper is related to the strand of the literature that analyzes optimal incentive schemes in the presence of intrinsic motivation and that seeks to identify the optimal organization of public firms when agents exhibit public service motivation. Here we analyze the optimal production schemes of public firms when (i) workers are intrinsically motivated and (ii) there are constraints on how production occurs. This work is based on the observation that most

\(^1\)The idea that a public service ethos motivates civil servants has been long explored by the public administration literature, which refers to this dynamic as public service motivation: “an individual’s predisposition to respond to motives grounded primarily or uniquely in public institutions” (Perry and Wise, 1990) that arises from the role of providing valuable social goods and services. ‘Public service’ motivation is a subset of ‘prosocial’ motivation, and both can be affected by intrinsic motivation. Since we deal with the production of public services and since there is no risk of confusion, we use these two terms interchangeably.
public goods and services are produced at a local level by public firms, which are constrained to
follow the same centrally dictated rules even when operating in different contexts. For example,
although the level of prosocial behavior among workers may be higher in some parts of the
country than in others, all public firms must follow the same set of rules about the organization
of production and the labor contracts offered. It is therefore important to understand how a
central authority chooses not only the optimal organization of production but also the incentive
schemes that public firms must adopt when production occurs in different local environments.
In analyzing the interaction between monetary and nonmonetary incentives as motivators of
civil servants, we consider the case where public employees are motivated to provide effort in
ways that confirm their identity. As described in the work of Akerlof and Kranton (2000, 2002),
such incentives are structured as gains and losses in utility from behavior that, respectively,
conforms or departs from the ideal prescribed for particular social or role categories (e.g., being
a “good” or a “bad” public employee).

In this paper we develop a principal–agent model that incorporates identity (in addition to
monetary rewards) as a motivation for the effort provided by civil servants. Agents, depending
on their preferences, self-select into one of two different groups (cf. Akerlof and Kranton, 2002):
bad workers choose their effort on the basis of monetary incentives only, whereas good work-
ers exert effort according to the employing public organization’s goals (because such workers
derive utility from thereby reaffirming their identity category).2 We then analyze the optimal
organization and incentive scheme in the event some production decisions are made at
a decentralized level. Specifically, each local unit consists of a principal and an agent; the
principal—who seeks to maximize net output—sets the wage as well as the minimum effort
level required of the agent. The agent’s effort is verifiable by the principal but not with cer-
tainty; the likelihood depends on the efficiency of the monitoring technology, which is chosen
by the central authority. That authority helps financially support each local unit, and its
choice of the monitoring technology is intended to maximize total output while constrained by
the fixed amount of resources available to finance the local units.

In our framework, a highly effective monitoring process increases the fraction of agents
self-selecting into the good-worker category. This “crowd in” effect arises because a more

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2 This concept of identity, first formalized in Akerlof and Kranton (2000), originates in the sociology and
psychology literatures. It can help refine economic utility theory by offering a means through which individuals
experience at least part of their utility. In reviewing Akerlof and Kranton’s (2010) Identity Economics, Pingle
(2012, p. 712) summarizes the theory underlying this concept as follows: “in a given social context, people will
tend to sort into a few social categories. The social category into which each person is placed is determined
either by conscious choice or environmental influences. A social category is defined by its associated behavioral
norms, or ideals, which prescribe desired behaviors. Utility increases with conformance and decreases with
nonconformance.”
effective monitoring reduces the rents that bad agents can derive from asymmetric information. Nevertheless, the central authority’s optimal solution involves choosing a monitoring technology that is only moderately effective at detecting shirkers. The reason is that a lower likelihood of detection makes it optimal for the principal of each local unit to reduce the effort required of agents and the wage paid to agents. Such an approach generates two effects on total output. The first one is negative and is due to the reduction of effort in units with bad workers (the effort of the agents and output in units with good agents are instead unchanged). Yet the second effect is positive and follows because the lower cost of each local unit (due to the lower wages paid, as less effort is required of agents) enables the central authority to finance more of them. If the monitoring technology is highly effective then—as there are many local units with good civil servants and the average agents’ effort does not substantially decline under loosened monitoring—reducing the likelihood of detection allows the central authority to increase the number of units while suffering only a small reduction in average unit output. Hence this second effect dominates and so output increases overall when less effective monitoring technologies are adopted. The opposite scenario obtains when the monitoring technology is extremely ineffective, which explains why the optimal technology is characterized by an intermediate level of monitoring.

This result is consistent with the literature finding that it may be optimal to reduce high-power incentives when agents are intrinsically motivated (Frey, 1997; Bénabou and Tirole, 2003), but the mechanism leading to our main result is new. In fact, it is related to a general equilibrium effect (see Section 3) as mediated by the public administration budget constraint and by the firm’s composition of workers.

Our paper is related to the public administration literature that has provided evidence of intrinsic motivation among public-sector employees (Guyot, 1962; Crewson, 1997). More recent works have investigated whether individuals with higher levels of intrinsic motivation are employed more often in the public sector. For example, Gregg et al. (2011) use data from the British Household Survey Panel (BHPS) and the Labor Force Survey to investigate whether prosocial behavior—as measured by the probability of working extra, unpaid hours—is more prevalent in the nonprofit than in the for-profit sector. These authors find that individuals in the nonprofit sector are significantly more likely to work such extra hours. Georgellis et al. (2011) also use data from the BHPS; their results support the hypothesis that individuals are attracted to the public sector more by intrinsic than extrinsic rewards.

However, some research has cast doubts on the existence of public service motivation—either by showing that public- and private-sector employees do not differ significantly in their
valuations of intrinsic and extrinsic rewards or by establishing that the presence of intrinsic motivation does not affect individual decisions to work in the public sector (for a selective review of research on the existence and the effects of prosocial behavior among individuals working in public organizations, see Polidori and Teobaldelli, 2013). These mixed findings could result from such confounding factors as the presence of monetary rewards (or other extrinsic factors) that, in the sorting process, “crowd out” intrinsic motivation. For example, Delfgaauw and Dur (2010) show that a higher wage increases the probability of filling a job vacancy but at the cost of attracting less motivated applicants. The literature asserting that monetary incentives and other extrinsic rewards can weaken intrinsic motivation and the willingness of individuals to behave altruistically (a.k.a. motivation crowding out theory) is comprehensively surveyed by Frey (1997, 2008) and Frey and Jegen (2001). Nyborg and Rege (2003) provide a discussion of some models illustrating the interplay between economic and moral or norm-based motivation for voluntary contributions to public goods and their policy implications.\(^3\)

There is also an extensive theoretical literature analyzing the implications of—and optimal incentive schemes for—individuals having intrinsic or prosocial motivation (e.g., Bénabou and Tirole, 2003). Our work is most closely related to Akerlof and Kranton (2000, 2002, 2005) and we use their framework, which allows us to describe agent behavior in terms of agent concerns about their self-image (their “identity”). Akerlof and Kranton argue that an employee’s attachment to a specific organization constitutes an intrinsic motivation that is consistent with positive self-perception and may allow the firm to replace or integrate monetary incentives as a means of motivating individual behavior. Once individuals join an institution, their identity varies in accordance with the ideal behavior associated with that institution: they identify with it and so are motivated to put forth effort in ways that enable them to conform to that ideal. As a result, identity-based incentives may be useful supplements to extrinsic (monetary) rewards if the goal is to mitigate agency problems. This finding is especially relevant for government agencies, which are characterized by limited scope for standard monetary incentive schemes (because such agencies are typically budget constrained and their intended outcomes cannot be observed accurately).\(^4\) Hiller and Verdier (2014) also employ the concept of identity to analyze

\(^3\)For interesting contributions about the tradeoff between extrinsic and intrinsic motivations explaining voluntary contributions see Frey and Oberholzer-Gee (1997), Schram (2000) and Benabou and Tirole (2003). In a more recent paper, Kakinaka and Kotani (2011) develop a model of voluntary contributions to a public good in a large economy with the interplay between peoples’ preferences of extrinsic and intrinsic payoffs and the possibility that public provision discourages moral motivation in the intrinsic payoff.

\(^4\)Because people interact within a plurality of groups and social categories, each individual is endowed with both a personal identity and multiple social identifications. Sen (1985, 2002) observes that identity has important effects on individuals’ welfare, goals, and norms of conduct, and he argues that individuals develop a plurality of identities that are essential for their view of themselves and for their decision making.
optimal investment of private firms in creating a “corporate culture” among its workers. Along this line of research, Glazer (2004), Prendergast (2007) and Delfgaauw and Dur (2008) study situations where workers care about what they produce, beyond the pay they receive, while other works address the importance of matching agents’ preferences with the organization’s mission (Besley and Ghatak, 2005) or the employer’s identity (Francois, 2000, 2007) for the provision of high-power incentives.\(^5\)

Our paper is closely related to the strand that analyzes the effects of multiple principals and/or multiple tiers (i.e., hierarchical principal–agent relationships, often present in public organizations, where a higher-tier agent is also a lower-tier principal) on the optimal organization of production (Dixit, 2002; Francois and Vlassopoulos, 2008). We remark that multitasking has been identified as a key determinant in the process of crowding out intrinsic motivation. Thus, an agent who attends disproportionately to directly rewardable actions may crowd out his own inclination for devoting effort to actions that are more socially meritorious but more difficult to contract (Bénabou and Tirole, 2003).

The paper proceeds as follows. Section 2 describes the model, which is then analyzed in Section 3. Section 4 concludes with possible directions for further research, while the appendices contain some proofs and extensions.

2 The Model

We present a principal–agent model in which a central authority establishes a number \(n\) of local units to produce a social good or service. Each unit hires a worker, and the amount of output produced is linear in the effort \(e\) of the agent (which is private information).\(^6\) Effort and output are assumed to be verifiable by the principal with some probability \(p \in [\underline{p}, \bar{p}]\), where \(\underline{p}\) and \(\bar{p}\) are defined in what follows. The monitoring technology \(p\) is endogenous, and we assume that it can be chosen (and implemented) by the principal at no cost.

The production function is

\[
y = ke, \tag{1}
\]

and the pecuniary cost of effort of the agent is quadratic:

\[
C(e) = \frac{c}{2}e^2, \tag{2}
\]

\(^5\)Auriol and Renault (2008) analyze status allocation in firms and study how this symbolic but scarce resource may be allocated by the principal so as to create the desired incentives.

\(^6\)In the baseline framework the level of effort \(e\) is a continuous variable. In Appendix C we extend the analysis to the case where the level of effort is a discrete variable and show that the results still hold in this modified version of the framework.
here $c > 0$ is constant and equal for all individuals. Individuals have no wealth and there is a “limited liability” constraint; hence the maximal punishment for an agent caught shirking is the forfeit of wage $w$. Shirking is defined as the agent exerting an effort lower than the one set by the principal. We also assume that all agents have the same outside option utility, which is valued at $w_0 > 0$.

We introduce a behavioral component into the agent’s utility function. This component captures the intrinsic motivation of civil servants to provide effort in ways that enhance their self-esteem while shaping and reinforcing their self-image and identity. As mentioned before, we use the concept of identity as role category:

The term identity is used to describe a person’s social category—a person is a man or a woman, a black or a white, a manager or a worker. The term identity is also used to describe a person’s self-image. It captures how people feel about themselves, as well as how those feeling depend upon their actions. In a model of utility, then, a person’s identity describes gains and losses in utility from behavior that conforms or departs from the norms for particular social categories in particular situations. This concept of utility is a break with traditional economics, where utility functions are not situation-dependent, but fixed. In our conception, utility functions can change, because norms of appropriate and inappropriate behavior differ across space and time. Indeed, norms are taught—by parents, teachers, professors, priests, to name just a few. Psychologists say that people can internalize norms; the norms become their own and guide their behavior. (Akerlof and Kranton, 2005, p. 12)

In particular, we assume that agents self-select themselves into two role categories—namely, good and bad civil servants—and that they subsequently choose a level of effort that conforms to the ideal behavior prescribed by the selected category. In other words, our framework employs the term identity to describe a civil servant’s role category: a good employee or a bad one. We assume that good civil servants obtain an identity payoff $I$ and that their prescribed effort is the socially optimal level $\hat{e}$ (viz., the level of effort that, absent asymmetric information, would be chosen by the principal). The identity payoff and the prescribed effort of bad civil servants are both normalized to 0 so that their utility and behavior correspond to the standard neoclassical ones. Individuals differ in their utility derived from the role status of

\footnote{Our framework is similar to that of Akerlof and Kranton (2002), who model the choice of optimal effort in schooling—a setting in which self-image, or identity, is salient. Depending on the individual’s characteristics, each student self-selects on a social category (leading crowd, nerds, and burnouts) and chooses her schooling effort accordingly.}
being good civil servants depending on the match between their individual characteristics and
the ideals for each category. Individual characteristics can be viewed as a person’s prosocial
values or natural predilection for honesty and civic virtues. We model such individuals using
the variable $h_i \in [0, 1]$. We have $h_i = 0$ for an ideal (good) civil servant, so agent $i$’s identity
payoff is $I_i = I^g - \gamma h_i$; here $I^g > 0$, and $\gamma$ measures how difficult it is for an individual who
differs from the ideal civil servant to fit in that group. We simplify the analysis by assuming,
without loss of generality, that the distribution of $h_i$ in society at large is uniform; hence the
density function is $s(h_i) = 1$ for all $h_i \in [0, 1]$.

Following Akerlof and Kranton (2002), we model individual utility as a convex combination
of the standard neoclassical utility function and a behavioral utility component related to the
role status. We thus write the utility function of a good civil servant as

$$U^g_i = \alpha \left( w - \frac{c}{2} e^2 \right) + (1 - \alpha) \left\{ \left[ I^g - \gamma h_i \right] - \left[ \frac{c}{2} (e - \bar{e})^2 \right] \right\},$$

(3)

where $\alpha \in [0, 1]$ is the weight attached to the pecuniary benefits and costs and $1 - \alpha$ is the weight
of the net gains from the role status. The latter is given by the identity payoff $(I^g - \gamma h_i)$ and
the disutility from exerting an effort different from the prescribed level for the role category.
Similarly, the utility of a bad civil servant is

$$U^b_i = \alpha \left( w - \frac{c}{2} e^2 \right) + (1 - \alpha) \left[ -\frac{c}{2} (e - 0)^2 \right] = \alpha w - \frac{c}{2} e^2,$$

(4)

which corresponds to the standard utility function.

The cost of each local unit is related to the wage $w$ paid to the agent. A fraction $\delta \in (0, 1)$
of the cost is paid by the local unit and the remaining fraction $1 - \delta$ is paid by the central
authority. Each local unit chooses the wage and the required effort of the agent that maximizes
the minimum value of the unit’s net output $y - \delta w$. In other words, as the local unit does not

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8Since individuals’ preferences are heterogeneous and since each local unit employs but one agent, this feature
of the model serves to capture the different contexts in which local units of public firms operate (e.g., locations
featuring more social capital or agents with a higher level of prosocial motivation).

9It is worth noting that while the utility of a bad civil servant reported in (4) contains only the pecuniary
benefits and costs of effort, it does not perfectly correspond to the standard neoclassical utility (as the component
in parenthesis multiplied by $\alpha$ in expression (3)) because the wage is multiplied by $\alpha$. This feature of the model
comes from the fact that we are using the same formulation of Akerlof and Kranton (2002) and model the
utility function of the individuals as the convex combination of the standard neoclassical utility and the net
gains (rather than the total utility) from the role status. However, this does not affect any of our results.
Indeed, it can be easily verified (and the details are available from the authors upon request) that using a
modified version of (3) where the wage $w$ is included in the gains from the role status, i.e.

$$U^g_i = \alpha \left( w - \frac{c}{2} e^2 \right) + (1 - \alpha) \left\{ w + \left[ I^g - \gamma h_i \right] - \left[ \frac{c}{2} (e - \bar{e})^2 \right] \right\},$$

leads to a standard neoclassical utility function for the bad civil servants, i.e. $U^b_i = w - (c/2) e^2$, and leaves the
results unchanged.
know the type of agent (good or bad) hired, it will choose the contract that maximizes its net output in case the agent hired is a bad one.\textsuperscript{10}

The central authority has an exogenous amount of resources $T$ that are used to finance the local units, whose number is therefore equal to $n = T / (1 - \delta)w$. The central authority chooses a monitoring technology $p$ that maximizes total output $G = \sum_{j=1}^{n} y_j$, where $y_j$ denotes the output of the local unit $j = 1, \ldots, n$.

It is worth emphasizing that while the organization of production for the provision of goods and services by the public sector differs widely across countries, and therefore it is not possible to construct a framework that fits well to all situations, our choice of assigning the right to set the wage by the local authorities is motivated by the fact that also in countries where the wage formation in the public sector is centralized, the local governments may often adjust wages. Indeed, Strom (1995) and Johansen and Strom (2001) while describing the Norway’s public sector wage setting system as highly centralized they argue that the local governments are allowed to adjust wages in various ways and find that the role played by formal and informal wage adjustments at the local level is important.\textsuperscript{11} An example similar to the Norwegian local government system where municipalities can alter the job classification of workers to meet certain goals in pay determination is represented by the US federal wage system.\textsuperscript{12} Holmlund (1997) highlights a gradual transition to more decentralized forms of wage-setting also in the public sector (in conjunction with the so-called cash limit) in a number of European countries during the nineties and argues (see p. 60) that the shift towards more decentralized wage-setting practices is presumably related to efficiency wages considerations, namely to the employers’ desire to adopt wage policies that motivate workers.

Finally, we assume that all local units are constrained to produce a positive level of public good. This assumption that also rules out the existence of (separating) equilibria in which some

\textsuperscript{10}This assumption allows us to capture the situations where the public sector also cares about (reducing) the variability of production across the units. And while it simplifies the analysis, it does not drive our main results. In Appendix B, we show that our main results do not change when the local unit maximizes the expected net output.

\textsuperscript{11}The three main ways of wage adjustments by local governments discussed in Strom (1995) and Johansen and Strom (2001) are the following; first, in the national wage contracts a (usually small) share of wage increases is stipulated to be decided at the local level; second, and more important, the local authorities have some discretion to reclassify jobs upward when appointing a person; third, the national wage contract allows local wage negotiations if productivity has increased due to organizational changes and gives the local authorities some discretion to adjust wages of important skilled workers in short supply.

\textsuperscript{12}Borjas (1980) analyze the wage differences between agencies in the US federal government and argues that while the US federal government has nationwide wage scales, federal agencies can manipulate the job classification to adjust wages. Borjas (p. 1111) concludes that “Despite the strict rules provided by the pay systems ... there are substantial wage differentials across agencies in the federal government after detailed standardization for differences in the average skills of the workers in each agency.”
units produce no output may be viewed as reflecting the geographically dispersed production of social goods and services, which makes it extremely costly to have zero (or a even low) production in some units.

3 Characterizing the Equilibrium

3.1 Equilibrium With Standard Utility Function

We first analyze the production of public services when individuals do not derive utility from role status; in this case, all agents behave as if they were bad—that is, maximizing the standard neoclassical utility function reported in (4). This case will prove to be a useful benchmark when we later define the optimal contract to offer to bad civil servants.

The wage that must be paid to the (bad) agent to keep him from shirking, for any level of effort, is determined by the following incentive compatibility constraint:

$$\alpha w - \frac{c}{2}e^2 \geq (1 - p)\alpha w,$$

(5)

where the left-hand side represents the agent’s utility from not shirking and the right-hand side is his utility from shirking. An agent who shirks does not exert any effort. This behavior is discovered with probability $p$, in which case the agent receives no wage; with probability $1 - p$ the shirking is not discovered and he is paid the contracted wage.$^{13}$ This setup implies that the efficiency wage is

$$w^* = \frac{c}{2\alpha p}e^2;$$

(6)

as expected, this value is increasing in the effort required of the agent and decreasing in the probability of effective monitoring.

The wage must also satisfy the following participation constraint:

$$\alpha w - \frac{c}{2}e^2 \geq w_0.$$

(7)

Because our focus is the moral hazard problem, we shall use the efficiency wage in (6) and then determine the parameter conditions that ensure the participation constraint (7) is always satisfied.

The level of effort that maximizes the net output of each local unit solves

$$\max_e ke - \delta w^* = ke - \frac{c}{2\alpha p}e^2$$

(8)

$^{13}$It is immediate that there is no gain for the agent in exercising a positive effort when this is lower than the required one. Indeed, in the state of the world (probability $p$) where the agent’s effort is verified by the principal, the latter will find it optimal not paying any wage if this is lower than the required level; in this case, it is optimal for the agent not exerting any effort. Similarly, there is no gain for the agent to exert a positive effort when shirking in the state of the world (probability $1 - p$) where the effort is not verified.
and is therefore equal to
\[ e_b = \frac{\alpha k}{\delta c} p. \]  
(9)

Hence the efficiency wage to be paid to the agent is
\[ w^* = \frac{\alpha k^2}{2\delta c^2} p \]  
(10)

and the agent’s maximum utility at equilibrium is
\[ U^b = (1 - p) p \alpha^2 k^2 / 2\delta c^2. \]

We use the efficiency wage (6) and the optimal effort (9) chosen by the local unit to establish that the participation constraint in (7) is always satisfied under the following condition:
\[ \frac{\alpha^2 k^2}{2\delta c^2} p (1 - p) \geq w_0. \]  
(11)

It is immediate that the left-hand side of (11) is a parabolic function in \( p \), so there always exists a level of \( w_0 \) satisfying (11) for all \( p \in [p_c, \bar{p}_c] \), where \( p_c \) and \( \bar{p}_c \) are the solution to equation (11) with the equality sign. Because the mechanisms emphasized in this work require the existence of a moral-hazard problem, we restrict the parameter space to the case where the participation constraint of the agent is never binding so that the wage is determined by the incentive-compatibility constraint (5). This is ensured by the following assumption.

**Assumption 1** \( p \in [p_c, \bar{p}_c] \) where \( p_c \) and \( \bar{p}_c \) are the solution to the following equation
\[ p(1 - p) = \frac{2\delta c^2}{\alpha^2 k^2} w_0. \]

Since all agents are identical, the total level of public services will be \( G = ny = nke \). Taking into account that \( n = T/(1 - \delta)w^* \), from (6) and (9) we derive \( G = 2\delta T/(1 - \delta) \). Our model thus implies that, when agents have a standard utility function, the total amount of public service provision is not affected by the choice of monitoring technology (represented by the level of \( p \)).

These results are summarized in the following lemma.

**Lemma 1** If individuals do not derive utility from role status (neoclassical benchmark), then the total level of public services is independent of the monitoring technology \( p \) employed and is equal to \( G = 2\delta T/(1 - \delta) \). Each agent exerts effort \( e_b = \alpha kp/\delta c \) and is paid an efficiency wage \( w^* = pak^2/2\delta c^2 \).
3.2 Equilibrium When Individuals Choose Their Identity

We now analyze the principal’s optimal choice when individuals also choose their role status. In this case, our previous analysis—concerning the efficiency wage and the optimal effort chosen by the agents who select themselves into the identity category of bad civil servants—is unchanged. This means that the optimal effort level of bad agents is given by (9) and the salary paid by (6).

Before commencing our analysis of identity selection, we must determine the prescribed effort $\hat{e}$ of the good civil servants; this value is assumed to be the optimal effort level under symmetric information. In other words, $\hat{e}$ is the effort level that maximizes the difference between the output and the cost of effort, $y - c(e)$, and is therefore the solution to

$$\max_e ke - \frac{c}{2}e^2.$$  

From the first-order condition of this maximization problem it follows that the optimal effort is

$$\hat{e} = \frac{k}{c} \quad (12)$$

and that the corresponding output is $\hat{y} = k^2/c$.

Under asymmetric information, the optimal effort level $e_g$ of a good civil servant is given by

$$\max_e U_g^i = \alpha \left( w - \frac{c}{2}e^2 \right) + (1 - \alpha) \left[ I^g - \gamma h_i - \frac{c}{2} (e - \hat{e})^2 \right], \quad (13)$$

which is equal to

$$e_g = (1 - \alpha) \hat{e} = (1 - \alpha) \frac{k}{c}. \quad (14)$$

here we have used $\hat{e}$ as given by (12).

We require that the effort level chosen by the good civil servants is not lower than that of bad ones, i.e. $e_g \geq e_b$, as otherwise there would not be any distinction between good and bad civil servants or the role status of good civil servant would not make sense. Comparing (9) and (14) shows that the effort level of good civil servants is higher than that of bad ones ($e_g \geq e_b$) provided $p \leq (1 - \alpha) \delta / \alpha \equiv \bar{p}_g$. Hence, the following assumption allows us to rule out the case where $e_g < e_b$.

**Assumption 2** $p \leq (1 - \alpha) \delta / \alpha \equiv \bar{p}_g$.

\footnote{We remind that each local unit does not know the type of agent (good or bad) hired and it chooses the contract that maximizes its net output when the agent hired is from the bad category. A discussion on this point is provided in Appendix B.}
When Assumption 2 holds, so that $e_g \geq e_b$, the optimal effort level of a good civil servant in (14) implies that the incentive compatibility constraint of the good civil servant is never binding. Indeed, such a constraint can be written as

$$
\alpha \left( w - \frac{c}{2} e_g^2 \right) + (1 - \alpha) \left[ I_g - \gamma h_i - \frac{c}{2} (e_g - \bar{e})^2 \right] \\
\geq \ p (1 - \alpha) \left[ I_g - \gamma h_i - \frac{c}{2} e^2 \right] + (1 - p) \left\{ \alpha w + (1 - \alpha) \left[ I_g - \gamma h_i - \frac{c}{2} e^2 \right] \right\}.
$$

(15)

The left-hand side (LHS) of the last expression is the maximized utility of a good civil servant when he exerts her optimal level of effort $e_g$. The right-hand side (RHS) of (15) represents instead her expected utility when he does not exert any effort; with probability $p$ the agent is caught shirking and she does not receive any wage (the first term represents the correspondent utility) while with probability $1 - p$ she is not detected and she receives the wage (and the utility correspondent to the second term). Rearranging terms in (15) leads to the following expression

$$
p\alpha w - \frac{c}{2} e_g^2 + (1 - \alpha) c e_g \bar{e} \geq 0,
$$

(16)

which is always satisfied (given the expression of $e_g$ reported in (14)) so confirming that the incentive compatibility constraint for the good civil servants is never binding.

The optimal selection of individuals into one of the two role categories implies that an individual $i$ will select herself into the good category if

$$
\hat{U}_i^g \equiv \alpha \left( w - \frac{c}{2} e_g^2 \right) + (1 - \alpha) \left[ I_g - \gamma h_i - \frac{c}{2} (e_g - \bar{e})^2 \right] \geq \alpha w - \frac{c}{2} e^2_b \equiv \hat{U}_i^b,
$$

(17)

where $e_g$ and $e_b$ are given by (14) and (9), respectively. The LHS (resp. RHS) of (17) represents the maximum utility of good (resp. bad) civil servants. Observe that the maximum utility of good agents is decreasing in $h_i$, which represents the distance from ideal of the individual’s characteristics. We can use (14) and (9) to rewrite this condition as

$$
h_i \leq \frac{I_g}{\gamma} + \frac{\alpha k^2}{2 \gamma \delta^2 (1 - \alpha)} \left[ \alpha p^2 - \delta^2 (1 - \alpha) \right] \equiv h^*,
$$

(18)

which means that all agents with $h_i \leq h^*$ (i.e., with characteristics closer to the ideal civil servant) find it optimal to select themselves as good civil servants whereas those with $h_i > h^*$

\footnote{The self-selection condition (17) of the individuals into the good category implies that the participation constraint for the good civil servants is never binding as long as this constraint is not binding for the bad ones (which is guaranteed by Assumption 1). In other words, since Assumption 1 implies that $\hat{U}_i^b \geq w_0$ and condition (17) that $\hat{U}_i^g \geq \hat{U}_i^b$, it follows that $\hat{U}_i^g \geq w_0$. It is also worth noting that in our framework there will never be a separating equilibrium. Indeed, the only possible separating equilibrium is the one where the wage is low enough (given the required effort) that only the good civil servants exert a positive level effort while the bad agents always shirks. The assumption that each local unit needs to provide a positive level of output rules out this strategy for the local unit.}
self-select into the bad category. Our assumption of a uniform distribution of \( h_i \in [0, 1] \) in society, \( s(h_i) = 1 \), implies that \( h^* \) also represents the fraction of good agents.

The following corollary clarifies how the monitoring technology affects the selection of individuals into the two categories.

**Corollary 1** The fraction of good agents \( h^* \) is increasing in \( p \).

**Proof.** The statement follows from a straightforward differentiation of (18). ■

Corollary 1 reflects that a more efficient monitoring technology (higher \( p \)) makes it optimal for each unit to require a higher effort from the agent, which translates into higher efficiency wages (see (9) and (6), respectively). Then, by (17), all agents receive the higher wage but only the bad ones need to exert greater effort.\(^{16}\) This dynamic implies that self-selecting into the good-agent category becomes relatively more convenient when the monitoring technology is more effective (i.e., when \( p \) is higher). This finding demonstrates the complementarity in our model between extrinsic (monetary) incentives and intrinsic (self-motivated) incentives.

The total amount of public service provision can now be written as

\[
G = n h^* k e_g + n (1 - h^*) k e_b = n k [h^* e_g + (1 - h^*) e_b].
\]

(19)

After we substitute \( n = T/(1 - \delta) w^* \), (6), (14), and (9) into (19) and then rearrange terms, the maximization problem of the central authority can be rewritten as

\[
\max_p G = \frac{2\delta^2 T}{\alpha p (1 - \delta)} \left[ h^* (1 - \alpha) + (1 - h^*) \frac{p \alpha}{\delta} \right],
\]

(20)

where \( h^* \) is given by (18). We recall that \( p \in [\bar{p}, \overline{p}] \) and that these bounds are determined by the conditions ensuring that the participation constraint is not binding and that the effort level chosen by the good civil servants is not lower than that of bad ones \( (e_g \geq e_b) \). These two constraints are summarized in Assumptions 1 and 2 from which it follows that \( p = p_c \) and \( \overline{p} = \min \{\bar{p}_c, \bar{p}_g\} \).

In order to simplify the presentation of the results, we first consider the case where \( p_c \geq (1 - \alpha) \delta/3\alpha \) and \( p_c \geq \bar{p}_g \equiv (1 - \alpha) \delta/\alpha \) which in turn imply that \( p \in [(1 - \alpha) \delta/3\alpha, (1 - \alpha) \delta/\alpha] \).

The details of the solution to problem (20) are reported in Appendix A. In particular, the optimal monitoring technology of the above problem is \( p^o = p^* \) where \( p^* \) is interior and implicitly defined by the following equation:

\[
\frac{\alpha^2 k^2}{2c \delta^3 (1 - \alpha)} p^2 \left[ \delta (1 - \alpha) - 2\alpha p \right] - (1 - \alpha) I^g + \frac{\alpha k^2 (1 - \alpha)}{2c} = 0
\]

(21)

\(^{16}\)Recall that the incentive compatibility constraint is not binding for good agents because \( e_g \geq e_b \) for all \( p \leq \bar{p}_g \).
as long as the following condition is satisfied:

\[ I^g = \frac{(2\alpha - 1) k^2}{2c} < I^9 < \frac{(1 + 26\alpha) k^2}{54c} \equiv \bar{I}^g, \quad (22) \]

that is, when the maximal identity payoff \( I^9 \) from the role status takes intermediate values. If the second inequality of (22) is not satisfied because the maximal identity payoff \( I^9 \) is too high (that is, \( I^9 \geq \bar{I}^g \)), then \( G(p) \) is monotonically decreasing in \( p \) for all \( p \in [\underline{p}, \bar{p}] \) and the optimal monitoring technology is \( p^o = \underline{p} \). At the other extreme, if \( I^9 \) is so low that the second inequality is violated (i.e., \( I^9 \leq \underline{I}^g \)), then there are no good civil servants for any monitoring technology, i.e. \( h^*(p) = 0 \) for all \( p \in [\underline{p}, \bar{p}] \), and we go back to the case reported in the neoclassical benchmark analyzed in Section 3.1 whose results are reported in Lemma 1.

The following proposition summarizes these results.

**Proposition 1** When \( p \in [(1 - \alpha) \delta/3\alpha, (1 - \alpha) \delta/\alpha] \) and condition (22) is satisfied, the optimal monitoring technology \( p^o = p^* \) where \( p^* \in (\underline{p}, \bar{p}) \) is interior and implicitly defined by equation (21). The effort levels of good and bad civil servants (\( e_g \) and \( e_b \)) and the efficiency wage \( w^* \) are given, respectively, by (14), (9), and (6) with \( p = p^* \); that is, \( e_g = (1 - \alpha) k/c \), \( e_b = p\alpha k/c \), and \( w^* = p\alpha k/2\delta^2 \). The fraction of good agents is \( h^*(p^*) \), as in (18), and the total amount of public services is \( G(p^*) > 2\delta T/(1 - \delta) \) as defined in (20). When condition (22) is not satisfied because \( I^9 \geq \bar{I}^g \), the optimal monitoring technology is \( p^o = \bar{p} \), while the equilibrium corresponds the neoclassical benchmark reported in Lemma 1 when \( I^9 \geq \bar{I}^g \).

The following corollary makes it clear that the results are basically unchanged when the assumptions \( \underline{p}_c \geq (1 - \alpha) \delta/3\alpha \) and \( \bar{p}_c \geq \bar{p}_g \equiv (1 - \alpha) \delta/\alpha \) are removed, i.e. if \( p_c < (1 - \alpha) \delta/3\alpha \) and/or \( \bar{p}_c < \bar{p}_g \equiv (1 - \alpha) \delta/\alpha \) (see Appendix A for details).

**Corollary 2** When \( \bar{p}_c < \bar{p}_g \) so that \( \bar{p} = \bar{p}_c \), Proposition 1 still holds except that the range of the maximal identity payoff \( I^9 \) from the role status reported in condition (22) is now equal to:

\[ I^9 = \frac{\alpha k^2}{2c} \left[ 1 - \frac{\alpha}{\delta^2 (1 - \alpha) \bar{p}_c^2} \right] < I^9 < \frac{\alpha k^2}{2\delta^2 (1 - \alpha)^2} \left[ \delta^3 (1 - \alpha)^2 + \alpha\delta (1 - \alpha) \bar{p}_c^2 - 2\alpha^2 \bar{p}_c^3 \right] \equiv \bar{I}^g. \]

When \( p = \bar{p}_c < (1 - \alpha) \delta/3\alpha \) the results are unchanged with respect to those reported in Proposition 1 except that now it cannot be proved that the optimal solution for \( p \) is always interior. In this case the optimal monitoring technology will be \( p^o = \arg \max \{ G(p), G(p^*) \} \).

The main result contained Proposition 1 is that the level of service provision is maximized for intermediate values of the monitoring technology \( (p^* < \bar{p}) \). This is somewhat surprising in
light of Corollary 1’s statement that the fraction of good agents $h^*$ is increasing in the efficiency of the monitoring technology $p$. The intuition for this result is as follows.

A lower probability $p$ that shirking will be detected reduces not only the effort level of bad civil servants but also the share of good agents. Each of these effects reduces the production of public services. However, lower $p$ also reduces the (efficiency) wages paid and allows the central authority to increase the number of local units—that is, of agents hired (remember, $n = T/(1 - \delta)w^*$). A fraction of the additional agents will self-select into the good category and will then exert more effort than is actually required, an effect that increases the level of public services provided. If $p$ is relatively high then the fraction $h^*$ of good civil servants is also high, and the latter effect dominates. Hence it is optimal for the central authority to adopt a less efficient monitoring technology (i.e., to reduce the value of $p$). Yet if $p$ is relatively low then the fraction $h^*$ of good agents is also low; now the former effect is likely to dominate, which means that an increase in $p$ is optimal. It should come as no surprise that these two effects exactly offset each other when $p = p^*$.

It is also now clear the reason why an interior solution for the optimal monitoring technology $p$ requires condition (22) being satisfied, namely the maximal identity payoff $I^g$ from the role status taking intermediate values. Indeed, when the maximal identity payoff $I^g$ is too high (i.e., $I^g \geq \bar{I}^g$), the fraction $h^*$ of good civil servants will be relatively high also when the monitoring technology is very inefficient (low $p$). Therefore, a reduction of $p$ leads to a reduction of the wage paid to the agents without a substantial reduction in the average effort (and production of each local unit) which means that the increase in the number of units will more than compensate the average reduction of production of each local unit making it optimal the choice of the most inefficient monitoring technology $p^o = p$. In other words, when the identity payoff is sufficiently high, then it is optimal to choose the most inefficient technology; this scenario is clearly also consistent with our theory. In this respect, it is worth noting that that the optimal level of monitoring $p^*$ is decreasing in the exogenous level of utility from identity $I^g$ (see Appendix A for details), which further highlights that it is optimal to reduce monetary incentives when agents have higher levels of intrinsic motivations. As we said above, the case where $I^g \leq \bar{I}^g$ is not much relevant because there are no good civil servants.

We thus obtain the result that—as already emphasized by the behavioral economics literature—it may be optimal to reduce monetary incentives when agents are intrinsically motivated. However, the mechanism enabling this result is not based on higher extrinsic incentives leading to lower intrinsic motivation, as our model predicts that more efficient monitoring and the consequent higher wages paid increase the likelihood of agents behaving in a socially desirable way;
rather, it arises from a general equilibrium effect working through the public administration’s budget constraint and the firm’s workforce characteristics.

4 Discussion and Conclusions

In this paper we have investigated the optimal organization of public firms, in the presence of agency problems, when individuals may derive utility from their status and production decisions are made at different levels. In particular, our approach has critically relied on two ideas: (i) agents may be motivated to exert effort not only via monetary rewards but also in ways that enable them to conform to some role category (e.g., the identity of a good civil servant); and (ii) although the production of public goods and services may take place under different local conditions, all firms must follow the same centrally determined rules.

We have shown that, in such contexts, it may be optimal for a central authority to choose a relatively inefficient monitoring technology (even though a more efficient one would also be costless) and to reduce monetary incentives. The mechanism leading to this result has not been described previously and is related to a general equilibrium effect mediated by the public administration’s budget constraint and by the composition of workers (bad versus good) within the firm.

The analysis presented here is in line with other works that emphasize the important role played by behavioral components in providing incentives for those who work in public organizations. In our model, intrinsic and extrinsic incentives turn out to be complements. However, some general equilibrium effects could make it optimal to reduce extrinsic (monetary) incentives, a practice often observed in the public sector.

Even though we have made some simplifying assumptions the results of our analysis are robust to variations of the framework. In particular, in Appendix B we show that our main results do not change when the local unit maximizes the expected net output rather than the net output in case the agent hired is a bad one. Similarly results still hold in a framework where the local authorities can choose among two levels of effort only, high or low, rather than in a continuous set (see Appendix C for details).

An interesting consideration relates to the financing system of local expenditures. We have considered a simple framework where a fraction of the cost of production of the public good is paid by the local unit and the remaining fraction is paid by the central authority. As highlighted by Strom (1999), the wage setting system should be related to the financing system of the local public sector because if wage bargaining is decentralized, then it may be
necessary to decentralize financing in order to avoid wage pressure. We think that including the financing system in our analysis is an interesting direction for future research but it is not essential for the mechanisms we want to highlight here. At the same time, we remind that the share of expenditures beared by the local and central authorities (i.e., the parameter $\delta$) does not play a significant role in our model.

This paper’s results have some interesting implications for policy-makers and regulators who wish to improve the public provision of valuable goods and services. We do not model the public firm’s incentive to invest resources in creating an identity among its workers. Yet our findings are in agreement with Pingle (2012, p. 712), who argues that “because output is typically produced from a team effort, individual incentives and monitoring may not well motivate workers, and identity provides an alternative motivator. An ‘insider’ worker identifies with the mission of the firm, while an ‘outsider’ does not. Firm investment in developing an insider identity in a worker may be more profitable than other more direct incentives.” In other words: since a sense of civic virtue or prosocial motivation may be imparted by the ad hoc creation of specific institutions that aim to strengthen the identity of the public officials via specific learning and training programs, it follows that a firm’s investment in developing the insider identity of workers may yield better returns than other, more direct incentives. This may allow public organizations to maintain their comparative advantage as regards relevance for the provision of social goods and services.

5 Appendix A: Solution to the Maximization Problem of the Central Authority

The first-order condition of maximization problem (20) is

$$\frac{\partial G}{\partial p} = \frac{2\delta^2 T}{\alpha \gamma p^2 (1 - \delta)} \left\{ \frac{\alpha^2 k^2}{2c \delta^3 (1 - \alpha)} p^2 \left[ \delta (1 - \alpha) - 2\alpha p \right] - (1 - \alpha) I^g + \frac{\alpha k^2 (1 - \alpha)}{2c} \right\} = 0. \quad (A.1)$$

In order to study the behavior of the first-order derivative of $G$ with respect to $p$, we consider the terms inside the braces and define

$$f(p) \equiv \frac{\alpha^2 k^2}{2c \delta^3 (1 - \alpha)} p^2 \left[ \delta (1 - \alpha) - 2\alpha p \right]$$

and

$$g \equiv (1 - \alpha) I^g - \frac{\alpha k^2 (1 - \alpha)}{2c},$$

so that

$$\frac{\partial G}{\partial p} = \frac{2\delta^2 T}{\alpha \gamma p^2 (1 - \delta)} \left[ f(p) - g \right]. \quad (A.2)$$
Consider first the case where $p \in [(1 - \alpha) \delta/3\alpha, (1 - \alpha) \delta/\alpha]$ and note that the sign of $\partial G / \partial p$ is determined by the function inside the brackets, since the other components are always positive. In particular, we have that the function $g$ is independent on $p$ while $f(p)$ is positive for all $p < (1 - \alpha) \delta/2\alpha$ and it is negative for $p > (1 - \alpha) \delta/2\alpha$. Moreover, $f(p)$ is strictly increasing for all $p < (1 - \alpha) \delta/3\alpha$ and is strictly decreasing for $p > (1 - \alpha) \delta/3\alpha$. Therefore, the function $f(p)$ has its global maximum at $p = (1 - \alpha) \delta/\alpha$ and takes its minimum value at the upper bound $p = (1 - \alpha) \delta/\alpha \equiv \bar{p}$.

Now notice that when
\[
\frac{(2\alpha - 1)k^2}{2c} \geq I^g,
\]then $h^*(p) = 0$ at $p = \bar{p} \equiv (1 - \alpha) \delta/\alpha$ and therefore for all $p \in [\underline{p}, \bar{p}]$ since $h^*(p)$ is increasing in $p$. In this case, there are no good civil servants for any monitoring technology and the solution of our problem corresponds to the case of neoclassical benchmark reported in Lemma 1. Condition (A.3) implies that $f(p)|_{p=(1-\alpha)\delta/\alpha} > g$.

If $\max f(p) = f(p)|_{p=(1-\alpha)\delta/3\alpha} < g$, which is the case when
\[
\frac{(1 + 26\alpha)k^2}{54c} \leq I^g,
\]
then from (A.2) follows that $\partial G / \partial p < 0$ for all $p \in [\underline{p}, \bar{p}]$; therefore, the value of $p$ maximizing $G$ is $p = \underline{p}$.

Therefore, condition (22) which is obtained combining (A.4) and (A.3) ensures the existence of a $p$ such that $p^* \in [(1 - \alpha) \delta/3\alpha, (1 - \alpha) \delta/\alpha]$ and $f(p^*) = g$ (as defined by equation (21)). Then $f(p) > g$ for $p < p^*$ and $f(p) < g$ for $p > p^*$ together imply that $G$ is maximized at $p^*$.

The level of monitoring $p^*$ is decreasing in the exogenous level of utility from identity $I^g$. Indeed, applying the implicit function theorem to equation (21) defining $p^*$ we obtain that
\[
\frac{\partial p^*}{\partial I^g} = -\frac{\partial IF / \partial I^g}{\partial IF / \partial p^*} = \frac{c\delta^3 (1 - \alpha)^2}{\alpha^2 k^2 p^* [\delta (1 - \alpha) - 3\alpha p^*]} < 0,
\]
as the denominator is negative as $p^* \geq \underline{p} \equiv (1 - \alpha) \delta/3\alpha$.

Corollary 2 extends the analysis to the case where $\underline{p} = \underline{p}_c < (1 - \alpha) \delta/3\alpha$ and $\bar{p}_c < \bar{p}_g \equiv (1 - \alpha) \delta/\alpha$. The case where $\bar{p}_c < \bar{p}_g \equiv (1 - \alpha) \delta/\alpha$ is presented in the main text and the solution does not require additional details. When $\underline{p} = \underline{p}_c < (1 - \alpha) \delta/3\alpha$ the analysis presented in the baseline framework is unchanged except that there also exits a value of $p$, call it $p' \in (0, (1 - \alpha) \delta/3\alpha)$, such that $f(p') = g$; therefore, $\frac{\partial G}{\partial p}\bigg|_{p=p'} = 0$. We can easily verify that this is a local minimum because $G$ is decreasing (resp. increasing) in $p$ when $p$ is less (resp. greater) than $p'$. As a consequence, the optimal monitoring technology is now $p^0 = \arg \max \{G(\underline{p}), G(p^*)\}$ where $p^*$ is still defined by equation (21).
6 Appendix B: Alternative Objective Function for the Local Unit

In our baseline framework we assumed that each local unit chooses the wage and the required effort of the agent that maximize the minimum value of the unit’s net output, i.e. the net output in case the agent hired is a bad one. We here show that our main results do not change when the local unit maximizes the expected net output.

The maximization problem of the local unit (8) now reads

\[
\max_e k \left[ h e_g + (1 - h^*) e_b \right] - \delta w^*,
\]

(B.1)

where the wage \( w^* \) is still determined by the incentive compatibility constraint of the bad agent reported in (6). From (B.1) and (6) it follows that the optimal effort for each local unit is

\[
e_b = \frac{\alpha k}{\delta c} p (1 - h^*),
\]

(B.2)

and the correspondent efficiency wage paid to the agents is

\[
w^* = \frac{\alpha k^2}{2 c \delta^2} b (1 - h^*)^2.
\]

(B.3)

The comparison of (B.2) and (B.3) with respectively (9) and (10) shows that the effort and the correspondent efficiency wage set by the local unit in this modified framework are lower by a factor of \( 1 - h^* \) and \( (1 - h^*)^2 \) than their equivalent in the baseline model. The reason for this result is straightforward. As the local unit cares about the expected net output rather than the net output in case the agent hired is bad, it takes into account that with probability \( h^* \) the agent is good and exerts a high level of effort anyway. As a consequence, the local unit will find it optimal to reduce the required effort and the wage paid to the agent.

Assumption 1 ensuring that the participation constraint is not binding is unchanged except that the expression that defines \( \underline{p}_c \) and \( \overline{p}_c \) contains \( (1 - h^*)^2 \) at the RHS of the denominator; other things equal, this increases the lower bound \( \underline{p}_c \) and reduces the upper bound \( \overline{p}_c \) so that the set \([\underline{p}, \overline{p}]\) shrinks. Assumption 2 still ensures that \( e_g \geq e_b \) and this in turn implies that the incentive compatibility constraint for the good civil servants (15) is never binding also in this modified version of the framework.

The individuals’ optimal selection condition (17) into one of the two role categories is unchanged and condition (18) now reads

\[
h_i \leq \frac{I^g}{\gamma} + \frac{\alpha k^2}{2 \gamma c \delta^2 (1 - \alpha)} \left[ \alpha p^2 (1 - h^*)^2 - \delta^2 (1 - \alpha) \right] \equiv h^*.
\]

(B.4)
The expression in (B.4) differs from (18) for the presence of the term \((1 - h^*)^2\) inside the square brackets. As the required effort and salary paid by the local unit depends on the share \(h^*\) of good agents (see (B.2) and (B.3)), the expression for the share of good civil servants will be a function of \(h^*\) itself. Imposing the aggregate consistency condition, the expression for the share of good agents will be implicitly defined by the following equation

\[ h^*-\frac{\alpha k^2}{2\gamma c\delta^2(1-\alpha)}p^2(1-h^*)^2 - \frac{I^g}{\gamma} + \frac{\alpha k^2}{2\gamma c} = 0. \] (B.5)

Applying the implicit function theorem to equation (B.5) we obtain that the fraction of good agents \(h^*\) is increasing in \(p\) (i.e., \(\partial h^*/\partial p > 0\)) and therefore that Corollary 1 still holds.

Substituting \(n = T/(1-\delta)w^*\), (B.2), (B.3) and (14) into (19) and rearranging terms leads to the following maximization problem for the central authority

\[ \max_p G = \frac{2\delta^2 T}{\alpha p(1-\delta)} \left[ \frac{h^*}{(1-h^*)^2(1-\alpha) + \frac{p\alpha}{\delta}} \right], \] (B.6)

where \(h^*\) is implicitly defined by (B.5).

While it is now much more difficult to compute a closed-form solution for the optimal monitoring technology because of the complexity of the first order condition of (B.6) coming from the expression of \(\partial h^*/\partial p\), the solution to problem (B.6) is likely to have the same characteristics of the solution to problem (20). Indeed, the maximization problem in (B.6) differs from the one in the baseline model in (20) for the terms inside the square brackets and for the expression of the share \(h^*\) of good civil servants. However, one should note that the term inside the square brackets is still increasing in \(p\) (since \(\partial h^*/\partial p > 0\)) and the term outside the square bracket is unchanged (and decreasing in \(p\)).

In other words, assuming that each local unit maximizes the expected net output implies a more complicated framework but the forces behind our results are still there and they are likely to lead to the same results.

7 Appendix C: Discrete Effort Choice Variable

We assumed that the level of effort \(e\) is a continuous variable and explained (see footnote 13 for details) that a shirking agent always exerts no effort. In this appendix we show that our results do not depend on the effort level being a continuous variable by presenting a simplified version of our model where the effort is a discrete variable. In particular, we assume that the local authority can choose among two levels of effort only, high or low \((e_H > e_L)\). The agent can exert the prescribed effort (or the higher level in case the latter is \(e_L\)) or exerts no effort in
case of shirking, which implies that \( e \in \{0, e_L, e_H\} \). Without loss of generality, we also assume that \( e_H = \hat{e} \) as reported in (12) so that the good civil servants always find it optimal to exert high effort. The monitoring technology \( p \in [\bar{p}, \bar{p}] \) is defined in a set where the participation constraint of the agents is never binding.

The efficiency wage is still determined by the expression reported in (6) so that

\[
   w_L^* = \frac{c}{2\alpha p} e_L^2 \quad \text{and} \quad w_H^* = \frac{c}{2\alpha p} e_H^2, \tag{C.1}
\]

and the local unit will prefer the combination \((e_H; w_H^*)\) to \((e_L; w_L^*)\) if

\[
   ke_H - \delta w_H^* > ke_L - \delta w_L^*.
\]

Taking into account (C.1) the latter expression can be rewritten as

\[
   ke_H - \delta \frac{c}{2\alpha p} e_H^2 > ke_L - \delta \frac{c}{2\alpha p} e_L^2,
\]

which simplifies to

\[
   p > \frac{\delta c}{2\alpha k} (e_H + e_L) \equiv p_L. \tag{C.2}
\]

In words, the local authority chooses \((e_H; w_H^*)\) when the monitoring technology is very effective in detecting shirking agents, i.e. when \( p > p_L \) where \( p_L \) is defined in (C.2), while it chooses \((e_L; w_L^*)\) in the opposite case \((p < p_L)\); the local unit is indifferent between the two choices when \( p = p_L \).

Consider now the neoclassical case where individuals do not enjoy any identity payoff. The maximization problem of the central authority reads

\[
   \max_p G = n_i k e_i = \frac{T}{(1 - \delta)} w_i^* k e_i = \frac{2\alpha T p}{c e_i}, \tag{C.3}
\]

where \( i \in \{H, L\} \). It is immediate from (C.3) that for any given level of effort \( e_i \in \{e_L, e_H\} \), \( G \) is maximized by choosing the most efficient monitoring technology (i.e., the highest level of \( p \)) compatible with that level of effort. This means that the central authority will select \( p = \bar{p} \) if it prefers the local authority choosing \((e_H; w_H^*)\), and it sets \( p = p_L \) as defined in (C.2) if it wants the local authority choosing \((e_L; w_L^*)\). Therefore, the central authority will find it optimal choosing the most efficient monitoring technology \( p = \bar{p} \) if

\[
   G_H = \frac{2\alpha T \bar{p}}{(1 - \delta) c e_H} > \frac{2\alpha T p_L}{(1 - \delta) c e_L} = G_L,
\]

i.e. when

\[
   \bar{p} > \frac{e_H}{e_L} p_L \iff \bar{p} > \frac{e_H}{e_L} (e_H + e_L) \frac{\delta c}{2\alpha k}, \tag{C.4}
\]

22
while it sets \( p = p_L \) when condition (C.4) holds with the reverse sign. When condition (C.4) holds with equality, the central authority is indifferent between the two technologies \( p_L \) and \( \bar{p} \).

In the case just described, the neutrality result of the monitoring technology contained in Lemma 1 does not hold anymore as there is a technology, \( p_L \) or \( \bar{p} \), that dominates the others. And the reason behind this result is that some monitoring technologies generate lower rents for the agents and allow the production of more public good than others given a certain level of effort that will be optimally chosen by the local unit.

In order to show that our main result is still valid in this new version of the framework, we now consider the case where there are intrinsically motivated agents and show that the central authority could find it optimal choosing an inefficient monitoring technology and reducing monetary incentives in cases where the most efficient technology is instead optimal in a neoclassical framework.

The optimal selection of individuals into the good category now reads\(^{17}\)

\[
\hat{U}^g_i \equiv \alpha \left( w - \frac{c}{2} e_H^2 \right) + (1 - \alpha) \left( I^g - \gamma h_i \right) \geq \alpha w - \frac{c}{2} e_L^2 \equiv \hat{U}^b_i,
\]

and the fraction of good civil servants is equal to

\[
h^* = \frac{I^g}{\gamma} - \frac{c}{2\gamma(1 - \alpha)} \left( \alpha e_H^2 - e_L^2 \right).
\]

Also in presence of intrinsically motivated agents, it is immediate that \( G \) is maximized by the central authority by choosing the most efficient monitoring technology compatible with a given level of effort that will be chosen by the local unit. Again, the central authority selects \( p = \bar{p} \) if it prefers the local authorities choosing \((e_H; w_H^*)\), and it sets \( p = p_L \) whenever it wants the local authorities choosing \((e_L; w_L^*)\); in this latter case the level of public good provided is different than the one obtained in the neoclassical benchmark because a fraction \( h^* \) of civil servants exert high effort. Therefore, the central authority chooses \( p = \bar{p} \) if

\[
G_H = \frac{2\alpha kT \bar{p}}{(1 - \delta) c e_H} \geq \frac{2\alpha kT p_L}{(1 - \delta) c e_L^2} [h^* e_H + (1 - h^*) e_L] = G_L,
\]

which simplifies to

\[
\bar{p} > \frac{e_H}{e_L} p_L \cdot \frac{h^* e_H + (1 - h^*) e_L}{e_L} \equiv p_I. \tag{C.5}
\]

A comparison between conditions (C.4) and (C.5) shows that they differ only for the presence of the last term in the RHS of (C.5), which is higher than one. This means that in presence

\(^{17}\)In the utility of the good civil servants \( \hat{U}^g_i \), we are using the fact that \( e_H = \hat{e} \). However, it is immediate that removing this assumption does not affect our results.
of intrinsically motivated agents the adoption of relatively inefficient monitoring technology and lower monetary incentives are more likely than in the neoclassical benchmark where individuals only value monetary payoffs.

The following proposition summarizes the results obtained for the modified version of our framework presented in this appendix.

**Proposition 2** The equilibrium of the simplified version of our model described above is the following.

(i) if \( p \leq (e_H/e_L)p_L \) the central authority chooses the monitoring technology \( p_L < p \) defined in (C.2) both with or without the presence of intrinsically motivated agents and the local authorities choose the combination \( (e_L; w^*_L) \);

(ii) if \( (e_H/e_L)p_L < \bar{p} < p_I \) where \( p_I \) is defined in (C.5), the central authority chooses the monitoring technology \( p_L \) in presence of intrinsically motivated agents and \( \bar{p} \) when all agents care only of monetary payoff (neoclassical case); the local authorities choose \( (e_L; w^*_L) \) in the first case and \( (e_H; w^*_H) \) in the second one;

(iii) if \( p_I \leq \bar{p} \) the central authority chooses the monitoring technology \( \bar{p} \) independently on individuals’ preferences and local authorities choose \( (e_H; w^*_H) \).

Point (ii) of Proposition 2 describes the case that confirms our main result in this simplified version of our framework. Indeed, in this case the central authority adopts the most efficient monitoring technology \( \bar{p} \) (and the local authorities choose \( e_H \) and \( w^*_H \)) when all agents care only about monetary payoff, while it adopts the relatively inefficient technology \( p_L < \bar{p} \) (and the local units choose \( e_L \) and \( w^*_L \)) in presence of agents who also care about their identity. While the mechanisms at work leading to this result are the same as those reported in the general version of our model and will not be repeated here, it is worth emphasizing that the forces behind our results are robust to variations of the framework and in particular they are not based on the effort level being a continuous variable.

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