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Bureaucratic Identity and the Shape of Public Policy: A Game Theoretic Analysis

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Bureaucratic Identity and the Shape of Public Policy: A Game Theoretic Analysis

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Bureaucratic Identity and the Shape of Public Policy:

A Game Theoretic Analysis

Abstract:

Since Max Weber's seminal piece on public bureaucracy it is acknowledged that the social identity of public bureaucracies is playing an important role for the provision of public goods. This paper aims to investigate the impact of identity driven preferences of bureaucrats on public policy outcomes, when it is assumed that a bureaucratic organization comprises different levels of administration. The paper proposes a theoretical framework to explain policy drift, when identity moderates the principle-agent relation between the legislator and the bureaucratic organization. The model points to the subtle interaction between different administrative levels of bureaucracy and how this interaction shapes the structure and size of budgetary allocations. Conceptually we enrich the public choice tradition of modeling bureaucracies by insights which fall broadly into the study of organizational behavior. Our analysis produces two main results: First, the possibility of an inefficient policy outcome is higher if the identity-based preferences of a high-level bureaucrat diverge from the preferred policy goal of the legislator. Second, bureaucrats with different roles (policymaking or implementation) have different individual goals, and it is the interplay of these different goals, which determines the provision of the public good. A key policy implication is that it can be more effective to change or amplify the identity of higher-level bureaucrats and to make their behavior conform to the political goals of the legislator than to build-up a tight regulatory environment, which becomes circumvented by smart bureaucrats.

JEL: D73, H11

1 Introduction

In recent years the notion of identity has given rise to a rich debate in economics (Akerlof and Kranton, 2000; Wichardt, 2008; Chen and Li, 2009; Benjamin et al., 2010; Kranton et al., 2013). The focus has been, for instance, on the desire of individuals to conform with shared norms in society (Benabou and Tirole 2006), the cognitive aspects of norms (Horst, Kermin and Teschl 2007), or the sense of belonging (R. Akerlof 2009). A common denominator of these research routes is the ambition to find more valid explanations of actual decision making when social context and cognitive stances matter.

Adding to this stream of research the paper aims at investigating the impact of identity driven preferences of bureaucrats on public policy outcomes, when it is assumed that a bureaucratic organization comprises different levels of administration. The paper proposes a theoretical framework to explain policy drift (a bureaus deviation from the policy goal of the legislator) where identity moderates the principle-agent relation between the legislator and the bureaucratic organization. In standard economic models of bureaucracy the agent (bureaucrat) leverages his discretion in order to increase the size of the budget, which results in private benefits for him but suboptimal outcomes from a welfare point of view (Niskanen, 1968, 1971, 1991). In such models, the problem of policy drift arises due to uncertainty and information asymmetry which are inherent in the principal-agent relation (Weingast, 1984; Moe, 1987). However, those budget maximizing models have been challenged because of their neglect of possible non-pecuniary motivations of bureaucrats such as norms, identities and public sector ethos or motivation (e.g., Dixit 2002; Buelens and Broeck 2007; Gains and John 2010). Similarly, Brehm and Gates (1997) argue that there is a need to go beyond the pecuniary motivation of bureaucrats and to consider non-pecuniary preferences that are driven by solidarity considerations and group pressure. Despite these calls for bringing in non-pecuniary factors to the analysis of bureaucrats' policy choices, very little concrete work has been accomplished so far to get a conceptual framework which aligns the incumbent economic models of bureaucracy with the

challenges from behavioral science. With a few exceptions of models that assume bureaucrats to be bounded rational, almost all models of bureaucracy consider bureaucrats as rational actors (Gailmard and Patty 2007; Krause and O'Connell 2012; Carpenter and Krause 2012).

However, a bureaucrat is part of (sometimes large) organizations and he gets accustomed and exposed to certain perceptions and preferences of the organization. Hence, he acts not only as a rational actor on his own account but also as an encultured actor, whose perception of a supposed "good policy" is deeply influenced by the social context that he is part of (see, e.g. Hoff and Stiglitz 2016). He learns of what is seen in-house as a good public policy and how this translates into certain budgetary allocations. In this sense his budgetary preferences are based on narratives, norms and identities prevalent in an organization. Subsequently he chooses specific budget allocations through the lens of his organizational social context. According to March's (1999) logic of appropriateness, decision-making is identity fulfillment, and not an achievement of optimal results in the presence of restrictions. This is consistent with the view that an organization is a form of formalized social system where one considers it as essentially to comply with organizational goals to be considered as a member of the organization (Arrow 1994; Davis, 2003, 2006, 2007).

For that background we model the policy outcome of a bureaucracy, when it is assumed that there are differences of identity-based preferences between bureaucrats at the policymaking level and bureaucrats at the policy implementation level. The model reveals the subtle interaction between these two groups of players in a bureaucracy and how this interaction shapes the structure and size of budgetary allocations. Conceptually we enrich the public choice tradition of modelling bureaucracies by insights which fall broadly into the study of organizational behavior.

More concretely, the paper analyses the impact of mission orientation in bureaucracies, taking into account statutory distribution of powers and functional responsibilities of agents across different layers of bureaucratic organization. It is

assumed that a bureaucracy consists of two vertically distinct layers: 1) A superior who allocates the budget to the different public goods on offer and who identifies with the higher level goals of the bureaucracy (insider identity); and 2) a subordinate who executes the allocation policy of the superior and is only driven by his private interests, without identifying himself with the organizational goals (outsider identity). Furthermore it is assumed that there is strategic interaction between the legislator and bureaucracy. This model setup highlights the possibility of tradeoffs between individual and organizational goals and provides a more realistic approach for the analysis of bureaucracies (Akerlof and Kranton 2000, 2005, 2010).

The rest of the paper is organized as follows. First, we briefly account for the need to give more focus on matters of organizational behavior in the economic analysis of bureaucracy (section 2). Then a link is made to the concept of identity and how it can be aligned with economic research on bureaucracy (section 3). Section 4 provides a detailed literature review pertinent to the present study. Thus prepared section 5 presents a game theoretic framework, which captures the strategic interaction among players in a model of bureaucratic hierarchy, taking into account the different identities of agents in a bureaucratic setting. Section 6 concludes and hints to some insights for policy making.

2 Bureaucracies as complex organizational structures

Principal agent models are widely used to understand the relationship between bureaucrats and politicians. In its simplest form bureaucrats aim at maximizing output while politicians want to allocate more budget to their constituencies, in order to increase the chance of being reelected. From a welfare point of view these two different objective functions lead to an inefficient quantity and structure of the bureaucratic output (Niskanen 1971, Miller and Moe 1985, Gailmard and Petty 2012).

The standard model of bureaucracy emphasizes a goal conflict between a unitary bureaucracy and the legislator. In these models scant attention is paid to the

complexity of organizational structure of bureaucracies and the dynamics of non-monetary goals of bureaucrats in the course of implementing public policy (Simon 1947, Perrow 1986, West 1997).

However, bureaucracy as an organization is comprised of multiple agents with quite different political convictions and individual goals (Eisner 1992; Quirk 1981; Kelman 1987). Moreover, some bureaucrats may identify themselves with the goals of the bureaucracy more than others, facing a tradeoff between their individual goals and the goals of the bureaucracy (Waterman, Rouse and Wright 1998). The issue becomes even more facetted, if one takes into account that policies are formally promulgated by the hierarchy of bureaucracy, which structurally safeguards the organizational goal against possible opportunism of the individual bureaucrats (Mazmanian and Sabatier 1983, Tirole 1986, Crémer 1993). For that background a complex research field unfolds, in which bureaucratic behavior is determined by bureaucratic hierarchy, the preferences of the various players and organizational norms. The interplay of these factors creates various tradeoffs and makes the analysis of bureaucratic decision making quite demanding.

It has long been recognized that organizational structure plays an important role for bureaucratic decision-making (e.g., Downs 1967, McCubbins, Noll and Weingast 1987, Dalton et. al. 1980, Milgrom and Roberts 1990, Dunleavy 1991). Already Max Weber (1978) pointed to this and to the fact that bureaucracies are imprinted by organizational norms or identities. The blueprint of his analysis was the Prussian bureaucracy that worked like a machine where the single bureaucrat conceived himself as a sort of gear wheel propelling the machinery towards the goals of bureaucracy set by the Prussian legislator and the German Kaiser. What Weber and others have not explored is that different stakeholders in the hierarchy of bureaucracy may have distinct identities that interact with each other and that may impinge on the individual preferences. This rather complex picture of bureaucracy raises the question, how the notion of identity can be analytically seized and conceptually be integrated into economic research on bureaucracy.

According to the concept of identity introduced by Akerlof and Kranton (2010), utility functions are not fixed. They are rather affected by the situational context in which identities play out. For example, a bureaucrat who is newly recruited has less inclination towards identifying himself with the organizational goals than the superior who has spent a longer period in the organization and who is established among his peers. Thus the decisions of agents in a bureaucracy do not only depend on the maximization calculus of their individual utility functions but also on the degree of identification with organizational goals. That is identity emerges apart from individual utility functions, but interacts with individual utility functions for the background of the situational context. Consequently Akerlof and Kranton (2000, 717) describe the effect of identity on utility functions as a new type of externality, which can be principally integrated into economic analysis.

3 Bureaucracies as containers of identity

The concept of identity is not new. Psychologists and sociologists elaborate on it for decades. Identity comprises all kinds of qualities and values that are associated to a person, organization or larger group as society, culture or nation. Identity is the self-image that a person or group has from itself. It is the belief-system or the fundamental norms that guide us and which may prevent us to do things, which we would do if we had another identity (Davis 2011). Religious identity may serve as an example. A Christian who believes in the texts of Christianity, but does not live up to the Christian standards will feel ashamed (Akerlof 2007, 8).

The new impulse of the works of Akerlof (2007) and Akerlof and Kranton (2000, 2005, 2010) is that they fall into the broader class of models that seek to complement conventional economic analysis with cogent reasoning from other disciplines in order to draw a more complete picture of human decision making. The Akerlof concept of identity aspires for a conceptual integration between economics on the one hand and a behavioral finding that has ample empirical evidence (but is yet not well explained in economics) on the other hand.

Akerlof and Kranton (2005) develop the concept of identity by using the notion of situation-specific norms, which are the blueprints or scripts that people have internalized and which tell them how to behave in a specific situation. More specifically, the term identity is used to describe a person's "social category" (Charness, Rigotti, and Rustichini 2007) as well as his "self-image" (Turner et al. 1987). Identity captures how people "feel about themselves as well as how those feelings depend upon their actions" (Akerlof and Kranton 2000, p. 719). If a person's identity enters a utility function, the person will capture utility gains from a behavior that is in line with the established identity, and the person will experience disutility in case the behavior deviates from what is dictated by identity.

Akerlof and Kranton (2005) illustrate the concept of identity by a simple model, focusing in particular on the interaction between identity and work incentives. They assume that a worker who identifies himself as part of the organization derives utility by acting in the best interest of the organization and loses utility if he does not work in the best interest of the organization. In addition, the worker draws utility from his wage income and experiences disutility from his work effort. Thereby it is assumed that workers can have two different identities: He can be an insider who acts in the interest of the organization, or he can be an outsider who does not identify with the organization and who is more interested in pursuing his own goals. It can be shown that in case of an insider, the identification with the organization reduces the wage differential that is needed to maintain enough incentives for high work efforts. This simply follows from the fact that an insider worker maximizes his utility by exerting a high level of effort towards achieving the goals of the organization. The model demonstrates not only the interaction of identity and wage incentives, but also more generally that identity affects the choice set of decision makers.

As emphasized by Akerlof and Kranton (2005), the concept of identity is particularly relevant in case of public administrations, as for example military organizations. The ideal soldier, having an insider identity, is taken as a mission oriented and sharply differentiated character embodying "masculine makeup and

ethos" (Akerlof and Kranton 2010, p. 45). The soldier has a sharp corporate-like identity, signified by his strict observance of the rules and professional execution of orders in the chain of command. The soldier works in the best interest of the organization and his rewards consist of both his monetary income as well as his satisfaction from acting in line with his organizational identity. Military organizations actively use the promotion of identity as a strategic tool in their training programs to motivate soldiers to pursue military ideals. Besides the military organization, civilian workplaces also use worker identity as a motivation device. This is particularly important in situations where work effort is unobservable and monitoring is costly. In such situations worker identity can be instrumental in encouraging a high level of effort. Besides the example of soldiers, physicians in a hospital may serve as an example.

Going beyond motivational issues, it can be argued that public bureaucracies have a distinct identity of their own which is instrumental for influencing their policy choices. First, like the military, public bureaucracy is an organization with well-defined operational procedures and a vertical chain of command. Bureaucrats are career-oriented civil servants who are provided with professional training (including examinations) at least at the early stages of their career. Bureaucrats are also inculcated in a sense of mission and they have clear organizational goals in terms of public policies and public sector programs. Like other organizational actors, bureaucrats are likely to develop their distinct identities in terms of their policy goals, modes of implementation and other aspects of public policies. As a result, some bureaucrats have an insider identity, i.e. they are driven by their mission orientation and they are in full support of policies that promote the organizational objectives. Similarly, some bureaucrats have an outsider identity, their personal goals taking primacy over organizational objectives.

4 The agency of bureaucracy – a literature review

A significant body of literature explores the role of bureaucracy in public policy from a multidisciplinary angle.[1] Within this diverse literature there is a broad consensus about that politicians need specialists to execute their policies. Hence, politicians delegate certain policies to bureaus. In order to minimize monitoring and transaction costs politicians allocate prefixed budgets to the bureaus for which a specific output is expected in return (e.g. Weingast and Marshall 1988). However, there is an inherent tension between political control and the de facto autonomy of bureaucracy (Berry 1979, 1984; Rourke 1984). This tension and the effects of it are subject to different theoretical explanations. In the following we will briefly sketch out some of the generic approaches that can be found in that research field and we will hint to the relevance of taking identity into account for a proper understanding of bureaucracy.

4.1 The agency of policy delegation

Principal agent models are widely used to understand the relationship between bureaucrats and politicians (Moe 1982, Wood and Waterman 1994, Mitnick 1986, Vachrish 2004, Gailmard and Patty 2012, Lane 2013). The benefit of delegating authority to an agent is that it reduces the principal's costs to acquire relevant information and skills to fulfill a specific task. However, this comes at a price, because the agent may abuse his informational advantage to the detriment of the principal (Aghion and Tirole 1997). This is because principals and agents may have a divergence of goals. But even if bureaucrats and politicians have the same goal bureaucrats are likely to shirk and to produce output at higher costs (Mitnick 1986). In a nutshell, the informational advantage and expertise gives bureaucracy power that can be used to manipulate the quantity and quality of output (Niskanen 1971).

Principals are interested in both, the comparative advantage of employing a specialized agent on the one hand and having a cheap technology for monitoring

[1] See for example, Niskanen 1971, Miller and Moe 1983, Bendor and Meirowitz 2004, Bendor, Taylor and Van Gaalen 1987b.

the agent on the other hand (Mitnick 1986). This setup leads to so-called principal-supervisor-agent (P-S-A) models. Tirole (1986) presents a P-S-A model where a principal assigns the task of monitoring an agent to a supervisor. This structure resembles a generic form of bureaucratic organization. In this setting it can happen that the supervisor colludes with the agent due to side transfers by the agent. It comes not as a surprise that the collusion produces inefficiencies to the detriment of the principal. The potential collusion increases the cost of operating the hierarchy (Laffont and Tirole1986) by producing large diseconomies of scale as each involved layer increases the extracted rent (McAfee and McMillan 1995). Thereby the propensity for collusion becomes the stronger the longer the relation between the agent and the supervisor endures (Tirole 1986). This already hints to the idea of identity, when a supervisor coincides either with the policy goal of the principal or is more interested in rent extracting for his own purposes in coalition with the agent. However, neither the imprinting process of identity nor identity itself has become an explicit topic in the principal agent literature on bureaucracy so far.

4.2 The institutional theory of policy delegation

Often it is simply assumed that principal agent models are realistic approximations of behavior in organizations and that there is a simple dyadic relationship between bureaucrats and politicians. Not much attention is given to a better understanding, why there are goal conflicts between principals and agents in the first place and what the dynamics of those goal conflicts are (Moe 1982, 1983, Perrow 1986, Bendor and Meirowitz 2004).

Indeed, bureaucrats have due to their specific skills inherent advantages over politicians, especially if it is about the implementation of policies. They have a good understanding of the organizational procedures and other technicalities of bureaucracy; hence they can manipulate the output of bureaucracy to their advantage (Miller and Moe 1983, Niskanen 1971). However, from a more dynamic perspective another element enters the picture. Politicians aim at policies according to their ideology in the political spectrum. In order to implement their policy they must win elections, but in democracies they must fear that they will be not reelected

and that their policies will be superseded by their successors from another party. Thus, durable property rights do not exist in the political market (Moe 1983, Segal and Whinston 2010) and politicians must think about other vehicles to safeguard their policy stance once they are in office. One of those vehicles is to delegate policies to bureaus not for efficiency considerations but rather to make sure for the time when they are no longer in office that their rivals cannot easily change the policy. To reach that goal bureaucracies may get extra powers and be shielded through administrative independence against political influence. As a result powerful bureaucracies emerge which are imprinted with their founders' identity but leave ample room for the actual bureaucrat to live out his own preferences and identity (Moe 1990). In summary it is fair to say that the institutional theory of policy delegation points to important aspects of bureaucracy that are not easily captured by agency models. Moreover, the institutional theory of policy delegation addresses the problem of how politicians may safeguard their identity over time through the means of bureaucracy, giving at the same time bureaucrats a great leeway to live out their own identity (Bertelli and Feldmann 2006).

4.3 The coalition framework of bureaucracies

A bureaucracy does not consist of homogenous individuals with the same goals, preferences and identities leading to a monolithic bureaucracy. Rather there are different people with very different goals inhabiting a bureaucracy (Simon 1947, Bendor and Meirowitz 2004, Jo and Rothenberg 2014). Furthermore, the bureaucracy as an organization has its own policy goal and some agents identify with that goal and others do not. Hence, there can be a divergence of goals within an organization (Eisner 1992; Quirk 1981; Kelman 1987). The difference of policy goals can be due to differences in job status of individuals within an organization, but also different ideological perceptions may play a role (Waterman, Wright, and Rouse 1994). The presence of multiple agents and multiple principals with conflicting goals makes the analysis of a bureaucracy rather complicated. Therefore it has been argued that it is much more appropriate to assume coalition frameworks rather than traditional principal agent frameworks for the analysis of bureaucracies (March and Olsen 1984). Efficiency considerations may play a role in coalition

building, but not necessarily. This strand of literature coincides largely with the so-called "behavioral theory of the firm" which regards itself as an alternative to neoclassical approaches of the firm.

The coalition framework has been blamed of being not explicit enough about how a certain policy goal becomes stabilized in a bureaucracy over time and how a bureaucracy can stabilize itself as a corporate actor (Waterman, Meier 1998, Cohen 2012, Howlett 2009). But the coalition framework clearly points to the fact that bureaucracies have an internal structure built by people who share identities with each other (or not) and who engage with each other (or not) to pursue their goals in groups (Howlett 2002).

4.4 Identity as non-monetary reward

The basic principal agent model considers a generic goal conflict between bureaucracy and legislation. The notion of goal conflict, however, gets blurred when bureaucratic structure is taken into account. For example, if the legislator delegates a policy to the bureaucracy, multiple agents within the bureaucracy may have different functional tasks as well as different individual policy goals, making the overall goal conflict between legislation and bureaucracy less predictable. Furthermore, standard agency models of bureaucracy are challenged because of non-pecuniary motives of bureaucrats, which embody norms, culture, or the idea of public sector ethos (Perry and Wise 1990; Breham and Gates 1999; Meier and O'Toole 2006; Buelens and Broeck 2007). This underscores the need for extending agency models by incorporating organizational features as well as to take into account the identity of bureaucrats.

From an agency perspective a bureaucrat's utility is a function of his income that he receives from the principal in form of a budget. At the same time he gets disutility from the effort that he puts on behalf of the principal in administering the budget. However, if the bureaucrat's policy preferences are endogenous, he gets utility from performing the task, and in that case the principal can even pay out a smaller budget to reach the policy goal. This is in line with Prendergast (2007) who argues that bureaucrats can have an intrinsic motivation in carrying out policies.

Intrinsic motivation is related to, for example, finding sense in work, idealistic stances, or professionalism (Wilson 1989, Dewatripont, Jewitt, Tirole 1999) all of which lower the necessary budget. The flipside is that when the policy preferences of the principal and the agent diverge, then the principal has to control the policy drift not only by pecuniary incentives or tighter oversight mechanisms but also by influencing and changing the identity of the bureaucrat.

The notion of identity provides not only a plausible explanation for the effectiveness of non-monetary incentives in organizations, but also a sort of tub for the behavioral stances of bureaucrats which make them to deviate from opportunism. As a result, identity is a label for the strong binding forces of social networking in organizations, which have to be taken into account when one is out to deeper analyze bureaucratic decision making.

In the following we will elaborate on a formal model of bureaucracy that incorporates identity into an agency framework. This way it will become possible to reconcile the standard economic agency framework of bureaucracy with behavioral approaches for the explanation of bureaucratic decision making.

5 An agency model of bureaucracy with identity

In this section we develop a benchmark model for studying more deeply bureaucratic behavior in an organizational hierarchy. In the model it is assumed that bureaucrats aim at their individual advantage but have different identities. Bureaucrats may have a stance of identifying himself or herself with the goal of the bureaucracy and derive utility from this identification. Or, they may not identify themselves with the goal of the bureaucracy and gain utility only from pursuing strategies to their own benefit. Because both types of bureaucrats are tied together in the vertical hierarchy of bureaucracy, the interaction of both types of bureaucrats is leading to non-trivial outcomes of bureaucratic behavior.

a. Model set-up

The model consists of three players: A legislator who is the principal and two bureaucrats (labeled 1 and 2) who represent a boss-subordinate pair in a vertical hierarchy. Let $Q \in \mathbb{R}_{++}$ denote a composite good provided by the bureaucracy. The composite good can be thought of as encompassing all the goods and services publicly provided by the bureaucracy such as health, education, or physical infrastructure. For simplicity we assume that the composite good comprises only two types of publicly provided goods and services Q_a and Q_b. Let k be the share of Q_a in composite output, i.e. $Q_a = kQ$. Similarly, let $(1-k)$ be the share of Q_b in composite output, i.e. $Q_b = (1-k)Q$. The variable $k \in [0,1]$ can be thus thought of as representing a single dimension policy space capturing budgetary allocation policy.

The bureaucracy uses prefixed budgetary resources (B) for the production of the composite good. The aggregate production technology for the production of the composite good is defined by the following cost function:

$$TC = \xi(Q) \qquad (1)$$

Where TC are the total costs with $\xi_Q > 0$ and $\xi_{QQ} \geq 0$.

The principal derives utility from the provision of the composite good and provides the budget (B) to the bureaucracy. The payoff of the principal can be defined as:[2]

$$U_P(B; k, Q) = W_a(kQ) + W_b((1-k)Q) - C(B) \qquad (2)$$

$W_i(.)$ is the principal's assessment of goods and services provided by the bureaucracy and $C(B)$ is the opportunity cost of providing budgetary resources to the bureaucracy. It is assumed that $W_i'(.) > 0$ and $W_i''(.) \leq 0$ for $i \in \{a, b\}$ and $C(B)$ is an increasing convex function with $C'(B) > 0$ and $C''(B) \geq 0$.

[2] Notice that equation (2) also implicitly defines the policy preferences of the principal towards the budgetary allocation policy. More specifically, maximization of (2) with respect to the budgetary allocation policy k will yield the policy preferences of the principal.

We define the bureaucratic agency as a boss-subordinate relationship. Player 1 is the boss of a bureaucratic agency whereas player 2 is his subordinate. It is assumed that the boss sets the overall policy direction whereas the subordinate produces the public output in line with the policy guidelines of his boss. This setting coincides with the process of public policy determination in a bureaucracy where decision making takes place in a vertical hierarchy in which players have different statutory policy making powers. The higher echelons chalk out the broader strategic direction whereas the lower echelons then implement the policies. For example, the secretary of a ministry decides how much of the budget will be allocated to physical infrastructure and the subordinate will program it to concrete infrastructure projects as highways and railway tracks.

Furthermore, the boss is assumed to have an identity as an insider who is inclined to pursue the organizational goal of the bureaucracy. The organizational goal can be expressed in terms of a specific budgetary allocation policy k_1. For example, the bureaucracy might favor a certain development strategy that requires a particular level of budgetary allocation across different sectors such as physical infrastructure (say Q_a) or social sectors (say Q_b). A higher k_1 would thus indicate a bureaucracy's preference for spending more on physical infrastructure as compared with social sectors. Given this organizational goal, a boss with insider identity has an intrinsic incentive to pursue the organizational goal and thus would lose utility if he deviates from k_1. The utility of the boss can thus be defined as:

$$U_1(k; Q, k_1) = V_{1a}(kQ) + V_{1b}\big((1-k)Q\big) - \lambda(k-k_1)^2 \qquad (3)$$

The boss is assumed to derive positive utility from the overall size of bureaucracy, as measured by the quantities of the two provided public goods (V_{1i}). But because of his identity as an insider, he experiences a disutility $-\lambda(k-k_1)^2$ when he deviates from the organizational goal. The parameter $\lambda > 0$ captures the identity of the boss.

Contrary to the boss the subordinate has an outsider identity and maximizes his utility without regard of the organizational goal.[3] The subordinate derives utility from the size of the bureaucracy measured in terms of the quantity of the composite public good. Because of his strong self-interest he derives also utility from his discretion over the budget, which he can use for his own purposes. The utility of the subordinate is defined as:

$$U_2(Q) = V_{2Q}(Q) + V_{2S}((B - \xi(Q)) \quad (4)$$

U_2 is the utility of the subordinate, V_{2j} is the subordinate's assigned value to the composite public good (Q) and $V_{2S}((B - \xi(Q))$ is the discretion over the budget.

It is plausible to assume asymmetric information between the legislator and the bureaucracy as well as within the hierarchy of the bureaucracy. The bureaucracy has private information about its costs, which cannot be observed by the principal. According to (1) the total costs are given as:

$$TC = \xi(Q) = \phi Q \quad (5)$$

$\phi > 0$ are the marginal costs of production of the composite public good. ϕ is a random variable with a uniform probability distribution over the interval $[a, b]$. The subordinate knows the marginal costs whereas the boss and the principal only know its probability distribution.

The equilibrium is then defined as a triplet (B^*, k^*, Q^*) such that:

$$B^* = \text{argmax}\, U_P(B; k^*, Q^*) = W_a(k^*Q^*) + W_b((1 - k^*)Q^*) - C(B) \quad (6)$$

$$k^* = \text{argmax}\, U_1(k; Q^*, k_1) = V_{1a}(kQ^*) + V_{1b}\big((1 - k)Q^*\big) - \lambda(k - k_1)^2 \quad (7)$$

$$Q^* = \text{argmax}\, U_2(Q; B^*) = V_{2Q}(Q) + V_{2S}((B^* - \xi(Q)) \quad (8)$$

[3] It is shown in Appendix B that even if the subordinate also has a policy goal, the equilibrium is determined independently of his policy goal as long as the boss makes the policy choice. Hence, the assumption that the subordinate maximizes his utility without regard to organizational goal is not implausible.

b. Specification of functional forms

In a next step we have to derive the functional forms of the model and to get closed form solutions. To work out the closed form solutions we specify the functional forms for the players' valuations and accordingly the budgetary constraints. In particular:

$$W_a(kQ) = v(kQ) \tag{9}$$

$W_a(kQ)$ is the utility that the principal derives from Q_a. We assume that the utility function is linear, implying that the principal's marginal utility v from Q_a is constant, if the quantity of the composite public good (Q) is raised.

$$W_b\big((1-k)Q\big) = \gamma\big((1-k)Q\big) \tag{10}$$

$W_b\big((1-k)Q\big)$ is the utility that the principal derives from Q_b. Accordingly we assume that the utility function is linear implying that the principal's marginal utility γ from Q_b is constant, if the quantity of the composite public good (Q) is raised. Since the principal assigns different values to Q_a and Q_b it holds that $\gamma \neq v$.

$$C(B) = \omega B \tag{11}$$

$C(B)$ are the marginal opportunity costs that the budget produces for the principal. The principal could spend the budget also for other projects than the composite public good (Q). For example, he could pay back sovereign debts. $C(B)$ is considered to be a linear function of the budget *B* with a marginal opportunity cost given by ω.

$$V_{1a}(kQ) = \alpha_{1a}(kQ) \tag{12}$$

$V_{1a}(kQ)$ is the utility that the boss derives from Q_a if the quantity of the composite public good (Q) is raised. We assume that the utility function is linear; implying the marginal utility α_{1a} from Q_a is constant.

$$V_{1b}((1-k)Q) = \alpha_{1b}\big((1-k)Q\big) \quad (13)$$

Accordingly $V_{1b}\big((1-k)Q\big)$ is the utility that the boss derives from Q_b if the quantity of the composite public good (Q) is raised. We assume that the utility function is linear implying that the marginal utility of the boss α_{1b} from Q_b is constant. Furthermore, we assume that the marginal utilities that the boss derives from Q_a and Q_b are different ($\alpha_{1a} \neq \alpha_{1b}$). This implies that the boss values the two public goods differently.

$$V_{2Q}(Q) = \mu_2 Q \quad (14)$$

$V_{2Q}(Q)$ is the utility that the subordinate derives from the composite public good (Q). It is considered that the utility function is linear, implying that the subordinate's marginal utility μ_2 from the composite public good is constant. To keep the model tractable it is further assumed that the subordinate only cares about the overall size of the bureaucracy, which is captured by the level of the composite output, and not the composition of the public output in terms of Q_a and Q_b. This assumption is plausible, when an outsider identity is presumed and the bureaucrat mainly cares for the size of the budget, which he gets under control.

$$\xi(Q) = \phi Q \quad (15)$$

The total cost is a linear function of output. The more output is produced the more is the total cost. The linear cost function implies that the marginal cost ϕ is constant.

$$V_{2S}(B - \phi Q) = (B - \phi Q)^{\sigma}; \text{ with } 0 < \sigma < 1 \quad (16)$$

$V_{2S}(B - \phi Q)$ is the subordinate's utility derived from budgetary discretion or slack (the amount of the budget that is not spent for the production of the public good, but is available for the subordinate to pursue his own goals). The slack is defined as the total budget B minus the cost of production ϕQ, and σ is the elasticity of slack. We assume that the utility from budgetary slack has diminishing marginal utility $(\sigma < 1)$. This assumption is reasonable, because otherwise the

subordinate would simply appropriate the whole budget as slack and would not produce public output at all.

Finally, using the above functional forms, the payoffs of the players can be written as:

$$U_P(B;k,Q) = v(kQ) + \gamma\big((1-k)Q\big) - \omega B \quad (17)$$

$$U_1(k;Q,k_1) = \alpha_{1a}(kQ) + \alpha_{1b}((1-k)Q) - \lambda(k-k_1)^2 \quad (18)$$

$$U_2(Q;B) = \mu_2 Q + (B-\phi Q)^{\sigma} \quad (19)$$

c. Solution of the benchmark model

The interaction of the principal, the boss and the subordinate can be understood as a sequential game. At the first stage, the principal chooses a level of the budget. At the second stage, the bureaucracy observes this level of budget and determines its output. The budgetary allocation policy is then determined in a sequential move sub-game. In this sub-game the boss moves first and decides the allocation policy. The subordinate then decides the level of the composite public good. The sub-game can be solved by backward induction. We assume that the budgetary size and the allocation of the budget have already been decided and it is up to the subordinate to decide how to effectively implement it given his production technology. In our model the best response of the subordinate will significantly impact the allocation decision and budgetary size at later stages of the game.

Step 1: The optimization problem of the subordinate

The decision problem of the subordinate writes as:

$$\text{Max}_{\text{Q}}\ U_2(Q;B) = \mu_2 Q + (B-\phi Q)^{\sigma} \quad (20)$$

The solution to this problem can be written as (see appendix A)

$$\hat{Q}(B) = (1/\phi)B - \theta(1/\phi)^{\eta} \quad (21)$$

Where θ and η are parameters defined in terms of the marginal utility of the subordinate derived from the composite public good and the elasticity of the budgetary slack (see appendix A)

Equation (21) is the best response function of the subordinate for each budgetary allocation determined by the principal. It shows that an increase in the level of budget encourages the subordinate to increase the output of the composite public good. The extent of the increase depends on the productivity of the bureaucracy, which is the inverse of the marginal cost of production (i.e. $1/\phi$). Simply put, if a bureaucracy produces at low marginal cost, then an increase of budgetary resources translates into an overproportional output of the composite public good, while high marginal costs lead to a proportionally low increase of output. This observation reveals that the principal as well as the boss must have an interest in encouraging bureaucratic efficiency through appropriate incentives at the level of subordinates (for this finding see also Benabou and Tirole 2003; Dixit 2002).

Proposition 1: *Along the optimal path the subordinate, according to his marginal productivity, increases the output of the composite public good as a response to an increase of budgetary resources.*

The optimal path of the subordinate (equation 21) determines precisely how the subordinate reacts to changes of the budget allocation to bureaucracy. For example, if the principal decides to enhance the budgetary allocation, then the subordinate observes this increase and provides more composite output in order to maximize his utility. The extent of the increase in composite output is directly proportional to the productivity of the subordinate. However, what is important here is that we take organizational slack into account (equation 21). Organizational slack allows a subordinate to spend resources disproportionately on individual utility enhancing expenditures, for example perks, privileges and patronage (Lindsay 1976; Williamson 1964). As a result organizational slack hinders a bureaucracy being efficient, when a growing budget goes into the pockets of subordinate bureaucrats.

Step 2: The optimization problem of the boss

Given the optimal response of the subordinate, we solve next the optimization problem of the boss, who chooses the budgetary allocation policy, in order to maximize his expected utility.

$$\text{Max}_{\text{k}}\, EU_1(k; Q, k_1) = E\left\{\alpha_{1a}\left(k\hat{Q}(B)\right) + \alpha_{1b}\left((1-k)\hat{Q}(B)\right) - \lambda(k-k_1)^2\right\} \quad (22)$$

The solution to the maximization problem is expressed as:

$$\hat{k}(B) = [(\alpha_{1a} - \alpha_{1b})/2\lambda][B\, E(1/\phi) - \theta E(1/\phi)^{\eta}] + k_1 \quad (23)$$

$E(1/\phi)$ is the expected productivity of the subordinate (for further details see appendix A).

Proposition 2: *The boss' optimal choice of budgetary allocation policy depends on a composite of the marginal utilities derived from the composite public good, the identity parameter and his policy preference, taking into account the expected productivity of the subordinate.*

For example, along the optimal path an increase of budgetary resources would prompt the boss to alter his budgetary allocation policy in favor of Q_a, if his marginal utility of Q_a exceeds that of Q_b and vice versa. However, the boss' identity mediates this not surprising result in a non-trivial way, because the higher the expected marginal cost of production is and the lower the expected productivity of the subordinate, the less incentive has the boss to move his allocation policy from the point that coincides with his identity. As a result, the utility derived from growing public outputs might not be sufficient to induce the boss to change his policy ideal (for a similar argumentation see Akerlof and Kranton, 2005). Thus, while an increase in budgetary resources works as an incentive for the boss to change his budgetary allocation policy away from his ideal point, the freedom of the boss to adjust his policy stance is limited by his identity, which constrains the decisions of the boss. The stronger the identity of the boss is (a higher λ), the lower is the boss' willingness to change his budgetary allocation policy, and thus the more

budgetary resources would be required to induce him to change the budgetary policy. Thereby the subordinate significantly influences the allocation decision of the boss. If the subordinate is highly productive then this will induce the boss to change his budgetary allocation policy more easily and to deviate from his policy stance to reap the benefit of a higher public output. This result once more underscores the importance of including strategic interaction within a bureaucratic hierarchy into analyses of public policy making.

The productivity of the subordinate not only has implications for the identity based policy choices of the boss, it can also matter for the decisions of the principal. Hence a whole cascade of interrelated choices unfolds. A legislator may exactly know which policy outcomes shall be achieved – such as a workable pension system or a reliable supply of clean water – but the legislator may be uncertain about the specific policy which will achieve the objective. For example, a pension system might work either through private contributions to insurance schemes or through payments from general public revenues. But while the boss may be informed about specific policies to reach a certain policy goal (and hence the choice of policy may be in the hands of the boss), he may not have all the relevant information about the appropriate technology available at the implementation level. This gives a sort of strategic advantage to the subordinate, and hence the latter's productivity becomes crucial for the principal and the boss to get their policy stance implemented. However, the boss is more informed about the internal attributes of the bureaucracy than the principal and as a consequence he can exploit this informational advantage in order to leverage his agenda setting power to constrain the choices of the principal. This issue relates directly to one of the most prominent problems of political agency, namely bureaucratic drift where the bureaucracy pursues policies that subvert or diverge from the goals of the principal (Gailmard 2002, Bueno de Mesquita and Stephenson 2007; Horn and Shepsle 1989; Shepsle 1992).

Step 3: The optimization problem of the principal

Given the optimal solutions for the provision of the composite public good and the decision on the budgetary allocation policy (equations 21 and 23), the principal chooses a level of budget to maximize his expected utility:

$$\text{Max}_{\text{B}}\, EU_P(B;k,Q) = E\left\{v\left(\hat{k}(B)\hat{Q}(B)\right) + \gamma\left(\left(1-\hat{k}(B)\hat{Q}(B)\right) - \omega B\right\} \quad (24)$$

This optimization problem can be solved to yield the optimal level of budget:

$$B^* = \lambda\left[(\omega - \gamma.E(1/\phi) - (v-\gamma).k_1\right]/\left[(\alpha_{1a}-\alpha_{1b}).(v-\gamma).(E(1/\phi))^2\right] + \theta.E(1/\phi)^{\eta}/(E(1/\phi))^2 \quad (25)$$

Backward substitution yields the equilibrium values of the budgetary allocation policy (k^*) and the composite public output Q^*. Put together, these solutions define the perfect Bayesian Nash equilibrium of the benchmark model. It is characterized by ($\text{B}^*, \text{k}^*, \text{Q}^*$) such that:

$$B^* = \lambda\left[(\omega - \gamma E(1/\phi) - (v-\gamma)k_1\right]/\left[(\alpha_{1a}-\alpha_{1b})(v-\gamma)(E(1/\phi))^2\right] + \theta E(1/\phi)^{\eta}/(E(1/\phi))^2 \quad (26)$$

$$k^* = [\omega - \gamma E(1/\phi)]/[2(v-\gamma)E(1/\phi)] + [(\alpha_{1a}-\alpha_{1b})\,\theta E(1/\phi)^{\eta}/2\lambda]\left[\left(1-E(1/\phi)\right)/E(1/\phi)\right] + k_1[(2E(1/\phi)-1)/2E(1/\phi)] \quad (27)$$

$$Q^* = (1/\phi)\{\lambda\left[(\omega - \gamma E(1/\phi) - (v-\gamma)k_1\right]/\left[(\alpha_{1a}-\alpha_{1b})(-\gamma)(E(1/\phi))^2\right] + [\theta E(1/\phi)^{\eta}/(E(1/\phi))^2]\} - \theta\,(1/\phi)^{\eta} \quad (28)$$

A unique equilibrium exists if the preferences of the principal and the boss are not aligned for the two public goods, i.e. $(\alpha_{1a}-\alpha_{1b})(v-\gamma) < 0$. This is the case when the boss' marginal utility from providing Q_a is higher than the marginal

utility derived from the provision of Q_b, and if the principal's marginal utility derived from Q_a is lower than that derived from Q_b, and vice versa.

Proposition 3: *A shift in the organizational goal of the boss to allocate more budgetary resources to the public good Q_a (an increase in k_1) induces the principal to allocate more (less) budget to the bureaucracy, if the principal's marginal utility from Q_a is greater (less) than the marginal utility from the public good Q_b.*

This result illustrates how the principal's strategic reaction to a shift in the organizational goal of the bureaucracy is influenced by the insider identity of the boss. Since the principal knows the insider identity of the boss, he anticipates the propensity of the boss to shift the budgetary allocation towards Q_a. If the principal also prefers a higher Q_a then the principal will increase the budget. If the principal prefers instead a higher Q_b the budget will be decreased, in order to shrink the leeway of the boss. That means knowing the insider identity of the boss by the principal does not necessarily produce an ideal outcome from the standpoint of the principal and may exacerbate the problem of policy drift. Or, to put it differently, while normally the preferences of the principal in combination with the preferences of the bureaucrats are assumed to play the pivotal role in determining the overall policy direction, here the organizational goal of the boss takes primacy over the budgetary allocation process. This is because the boss gives more weight to the organizational goal and allocates more (less) budgets to a public good than his personal preferences would dictate him. Akerlof and Kranton (2000, 717) describe this effect as a new type of externality in the process of decision making. This finding has a straightforward policy implication, because if there are tradeoffs between individual preferences and a person's identity, then it might be more appropriate to nudge the identity of the boss in a bureaucracy than to constrain the bureaucracy by law and regulations (Akerlof and Kranton 2005, pp. 13-15). However, the question is to what extent identity is mutable.

Corollary: *A shift in the organizational goal of the boss to allocate more budgetary resources to Q_a (an increase in k_1), would result in more (less) provision of the composite public good if the principal's marginal utility from Q_a (e.g. physical*

infrastructure) is greater (lower) than the marginal utility from Q_b (e.g. social sectors)

This result is a straightforward extension of proposition 3. A shift in the organizational goal of the boss towards the preferences of the principal induces the principal to allocate more budget to the bureaucracy. An increase in budgetary resources in turn would encourage the subordinate to produce more of the composite public output. On the other hand, if the organizational goal of the bureaucracy diverges from the preferences of the principal, the bureaucracy's budget would be curtailed leading to a lower production of the composite public good. Apparently the insider identity of the boss is instrumental to the extent that it ensures the adoption of public policy by the boss in tandem with the shift of the organizational goal. This in turn has repercussions for the allocation of the budget by the principal to the bureaucracy.

In our model policy drift stems directly from identity driven preferences of the boss in a bureaucratic hierarchy. This distinguishes our model from earlier literature, where the principal is hesitant to delegate policy authority if the policy goal of the bureaucracy diverges from that of the principal (Gailmard 2009). In contrast, in our model even when the policy goals between the bureaucracy and the principal diverge policy delegation may still take place.

Proposition 4: *An increase of the opportunity cost of the budget induces the principal to a reduction of the budget allocation to bureaucracy leading to a lower provision of the composite public good. On the other hand, an increase of the opportunity cost of the budget prompts the boss to a change of the budgetary allocation policy towards more (less) allocation of budgetary resources to Q_a (e.g. physical infrastructure) if the principal's marginal utility of physical infrastructure is greater (lower) than the marginal utility derived from Q_b (e.g. social sectors).*

An increase of the opportunity costs of the budget forces the principal to cut the bureaucracy's budget, which in turn results in a lower provision of the composite public good. More importantly, an increase of the opportunity cost of the budget prompts the boss to change his budgetary allocation policy with regards to Q_a and

Q_b. The direction of this policy change, however, depends on the relative magnitudes of the principal's marginal utilities from the provision of the two public goods. Thereby, it is important to emphasize the role of bureaucratic hierarchy. The boss takes into account the strategic responses of the principal as well as that of the subordinate. For example, if the budgetary resources are cut, the boss anticipates a decline in the provision of the composite public output and reallocates the budget in line with the preferences of the principal.

In summary, the above analysis demonstrates how public policy is shaped by the interplay of the insider identity of the boss, the organizational structure of the bureaucracy and the preferences of the different players. The extent to which the identity of the bureaucracy is aligned with the goals of the principal becomes the key for understanding the determination public policy in a bureaucracy. The game-theoretic framework presented here focuses exactly on the alignment of identities across different levels of bureaucracy by taking a hierarchical organizational structure into account as well as strategic interactions among the players.

6 Identity and bureaucracy: Some conclusions and implications

A bureaucracy is an organization where social norms and policy taste play an important role. When the legislator delegates a policy to a bureaucrat it is shaped not only by the preferences of the bureaucrat but also by the social norms of the organization. This seemingly simple set-up creates a bunch of interesting questions: What role does a bureaucrat's identity play for the policy outcomes? What role does the internal organization of bureaucracy play for the policy outcome? Do all agents identify alike with the goals of bureaucracy? What are the tradeoffs between individual and organizational goals faced by a bureaucrat who identifies with the organization? And what are the externalities inherent to an identity augmented utility function of top echelon bureaucrats on politicians and low-tiered bureaucrats?

To assess these questions we develop a principal-supervisor-agent (P-S-A) model of policy choice, where the legislator and bureaucrats are driven by different

concerns. The legislator provides the budget, the top echelon bureaucrats make an allocation decision according to the goals of the organization, and the subordinate implements the policy choice.

The paper employs the Akerlof-Kranton concept of identity, in order to give an in-depth analytical description of the interaction between identity and hierarchical decision-making in a bureaucracy. We incorporate the notion of identity in a game-theoretic model that emphasizes the strategic interaction among bureaucratic actors at different levels of the bureaucracy and the legislator for the determination of public policies. In particular it can be shown that the identity of the boss in a bureaucracy plays an important role for the determination of public policies. If the boss has an insider identity and is driven towards pursuing organizational goals, then all equilibrium outcomes of the public policy are affected, including the overall size of the budget, the budgetary allocation policy and the size of the bureaucracy. Thereby the boss' decisions are constrained by the opportunity costs of budgetary resources and the marginal costs of providing the composite public good. Consequently, actual policy choices will only partly coincide with the policy ideal of the boss, but are amalgams of organizational and individual decision mechanisms which are interspersed by identity.

For that background, the paper contributes in three dimensions to the literature. First, we incorporate identity as a non-pecuniary motivation in the bureaucrat's utility function in order to analyze his behavior with regard to public policy choices. Second, we show that public policies are determined by the interaction of the various hierarchical layers of a bureaucracy. Third, we identify possible tradeoffs between individual preferences of bureaucrats and the organizational identity of a bureaucracy. The inclusion of identity into the analysis of bureaucracy yields a more facetted picture of policymaking.

Our analysis produces two main results. First, the possibility of an inefficient policy outcome, in terms of public good provision, is higher if the identity based preferences of the high-level bureaucrat diverge from the preferred policy goal of the legislator. Second, bureaucrats with different roles (policymaking or

implementation) have different individual goals and it is the interplay of these different goals which determines the provision of the public good. For example, whereas the boss wants to adhere to his identity preferences (non-pecuniary goal) the subordinate wants to increase the budgetary slack (pecuniary goal). Thus, lawmakers should not only be cognizant of the bureaucrats' identity, but it may be more appropriate to nudge the identity of the boss in a bureaucracy than to constrain the bureaucracy by laws and regulations, in order to reach a specific policy outcome (for a similar result see Akerlof and Kranton 2005, pp. 13-15).

An obvious question is to what extent identity is mutable? While pecuniary incentives can be devised to change the behavior of employees and their productive effort of employees, how much will it cost to change the identity of agents?

An important mechanism through which the legislator can ensure the effective implementation of his policies is the selection of bureaucrats. The two most popular selection mechanisms are: Meritocratic selection and partisan selection. It is apparent that partisan selection will bring bureaucrats ideologically closer to the principal's ideal policy choices. The tradeoff between the legislator's policy preferences and the bureaucrat's identity becomes smaller, and hence the frictions with regard to the allocation of public good provision decrease. However, those bureaucrats may lack expertise and training. As a result the provision of public goods may deviate considerably from what the legislator would have expected. More concretely, at the implementation stage (Step 1 of the model) the discretionary slack is larger due to the lack of professional expertise of partisan bureaucrats at the top-level of bureaucracy. Hence there is a tradeoff between minimizing frictions at the allocation stage (Step 2 of the model) and the enlargement of slack at the implementation stage (Step 1 of the model).

Bureaucrats selected in a meritocratic system typically have a higher level of policy expertise and ensure policy continuity because of their permanent positions in office. To the extent that policy drift depends on the productivity of the subordinates at the implementation level, a meritocratic system may be preferred

as expert bureaucrats at the top level are better able to increase and to monitor the productivity of the subordinate. However, the tradeoff between the legislators' preferences and the bureaucrats 'identity becomes higher, and hence the friction with regard to the allocation of public good provision increases. As a result the allocation of public goods may deviate from the ideal that the principal has in mind. Hence in both recruitment systems there is a tradeoff between identity driven preferences and the implementation of public policy.

Finally, there is a tradeoff between enacting laws to control the behavior of bureaucrats at the implementation level on the one hand and using nudging as a vehicle to influence the behavior of the higher echelon bureaucrats to control the problem of policy drift on the other hand. It can be more effective to change or amplify the identity of higher-level bureaucrats and to make their behavior conform to the political goals of the legislator than to build-up a tight regulatory environment which becomes circumvented by smart bureaucrats. As argued by Gely (2007), individuals may be less inclined to violate social norms than breaching the law (see also Elster 1989; Smith 2002, and Kaufman 1999).

Appendix A: Mathematical derivations

Optimization problem of the subordinate

$$\text{Max}_{\text{Q}}\ U_2(Q) = \mu_2.Q + (B - \phi.Q)^{\sigma} \quad \text{(A1)}$$

Let $\hat{Q}(B)$ be the optimal level of the composite public good given a fixed level of budget. Then $\hat{Q}(B)$ solves the following first order condition:

$$\partial U_2/\partial Q = \mu_2 - \sigma\phi(B - \phi Q)^{\sigma-1} = 0 \quad \text{(A2)}$$

Straightforward algebraic manipulation yields:

$$\hat{Q}(B) = B.(1/\phi) - \theta.(1/\phi)^{\eta} \quad \text{(A3)}$$

Where $\theta = (\mu_2/\sigma)^{1/\sigma-1}$, $\eta = \sigma/\sigma - 1$ ($\eta < 0$) and ϕ is the marginal cost of production. It can be easily seen from (A3) that the partial derivative of $\hat{Q}(B)$ with respect to B is:

$$\hat{Q}_B = 1/\phi \quad \text{(A4)}$$

Since the marginal costs are random, the expected value of $\hat{Q}(B)$ can be written as:

$$E\hat{Q}(B) = B.E(1/\phi) - \theta.E(1/\phi)^{\eta} \quad \text{(A5)}$$

It is assumed that ϕ is uniformly distributed over the interval $[a, b] \in \mathbb{R}_{++}$. So the expected values can be computed as:

$$E(1/\phi) = 1/(b-a)\int_a^b (1/\phi)\, d\phi = [1/(b-a)][\ln b - \ln a] \quad \text{(A6)}$$

Similarly:

$$E\,(1/\phi)^{\eta} = 1/(b-a)\int_a^b (1/\phi)^{\eta}\, d\phi = [1/(b-a).(1-\eta)][b^{1-\eta} - a^{1-\eta}] \quad \text{(A7)}$$

Optimization problem of the boss

Given $\hat{Q}(B)$ the boss maximizes the following expected payoff function:

$$\text{Max}_{\text{k}}\ EU_1(k; Q, k_1) = E\left\{\alpha_{1a}.\left(k.\hat{Q}(B)\right) + \alpha_{1b}.\left((1-k).\hat{Q}(B)\right) - \lambda.(k-k_1)^2\right\} \quad \text{(A8)}$$

Taking expectations, the above problem can be written as:

$$\text{Max}_{\text{k}}\, EU_1(k; Q, k_1) = \alpha_{1a}.\left(k.E\hat{Q}(B)\right) + \alpha_{1b}.\left((1-k).E\hat{Q}(B)\right) - \lambda.(k-k_1)^2 \quad \text{(A9)}$$

Let $\hat{k}(B)$ the optimal budgetary allocation policy. Then it solves the following first order condition:

$$\partial EU_1/\partial k = \alpha_{1a}.E\hat{Q}(B) - \alpha_{1b}.E\hat{Q}(B) - 2\lambda.(k-k_1) = 0 \quad \text{(A10)}$$

The above equation can be solved as:

$$\hat{k}(B) = [(\alpha_{1a} - \alpha_{1b})/2\lambda].E\hat{Q}(B) + k_1 \quad \text{(A11)}$$

Substituting for $E\hat{Q}(B)$ from (A5), equation (A11) can be solved as:

$$\hat{k}(B) = [(\alpha_{1a} - \alpha_{1b})/2\lambda].[E(1/\phi).B - \theta.E(1/\phi)^{\eta}] + k_1 \quad \text{(A12)}$$

From (A12), the partial derivative of $\hat{k}(B)$ with respect to B can be computed as:

$$\hat{k}_B = [(\alpha_{1a} - \alpha_{1b})/2\lambda].E(1/\phi) \quad \text{(A13)}$$

Optimization problem of the principal

Given the solutions for the composite public good and the budgetary allocation policy in the bureaucratic sub-game, the optimization problem of the principal can be set up as follows:

$$\text{Max}_{\text{B}}\, EU_P(B; k, Q) = E\left\{\upsilon.\left(\hat{k}(B).\hat{Q}(B)\right) + \gamma.\left(\left(1-\hat{k}(B).\hat{Q}(B)\right) - \omega.B\right\} \quad \text{(A14)}$$

The optimal level of budget B^* solves the following first order condition:

$$\partial EU_P/\partial B = E\left\{\upsilon.\left[\hat{k}(B).\hat{Q}_B + \hat{Q}(B).\hat{k}_B\right] + \gamma.\left[\left(1-\hat{k}(B)\right).\hat{Q}_B - \hat{Q}(B).\hat{k}_B\right] - \omega\right\} = 0 \quad \text{(A15)}$$

Proposition 3

Using equations A4, A5, A12, and A13, equation (A15) can be solved for equilibrium B^* as follows:

$$B^* = \lambda\left[(\omega - \gamma.E(1/\phi) - (\upsilon - \gamma).k_1\right]/\left[(\alpha_{1a} - \alpha_{1b}).(\upsilon - \gamma).(E(1/\phi))^2\right]$$

$$+\theta.E(1/\phi)^{\eta}/(E(1/\phi))^{2} \quad \text{(A16)}$$

Substitution of (A16) in (A3) yields:

$$Q^{*} = (1/\phi)\,\lambda\{\big[(\omega-\gamma.E(1/\phi)-(\upsilon-\gamma).k_1]/[(\alpha_{1a}-\alpha_{1b}).(\upsilon-\gamma).(E(1/\phi))^{2}\big]$$
$$+[\theta.E(1/\phi)^{\eta}/(E(1/\phi))^{2}]\}-\theta.(1/\phi)^{\eta} \quad \text{(A17)}$$

Similarly, substituting (A16) in (A12) yields:

$$k^{*} = [\omega-\gamma.E(1/\phi)]/[2(\upsilon-\gamma).E(1/\phi)]$$
$$+[(\alpha_{1a}-\alpha_{1b})\theta.E(1/\phi)^{\eta}/2\lambda][\big(1-E(1/\phi)\big)/E(1/\phi)]$$
$$+k_1.[(2.E(1/\phi)-1)/2.E(1/\phi)] \quad \text{(A18)}$$

Existence of equilibrium

We assume that the players' payoff functions are twice continuously differentiable. To verify the existence of an equilibrium, the second order conditions of each player can be checked as follows. Differentiating (A2) with respect to Q:

$$\partial^2 U_2/\partial Q^2 = \phi.\sigma.(\sigma-1).(B-\phi.Q)^{\sigma-2} < 0, \text{since } 0<\sigma<1 \quad \text{(A19)}$$

Similarly, differentiating (A10) with respect to k:

$$\partial^2 EU_1/\partial k^2 = -2\,\lambda < 0, \text{since } \lambda > 0. \quad \text{(A20)}$$

Finally, differentiating (A15) with respect to B yields:

$$\partial^2 EU_P/\partial B^2 = (\alpha_{1a}-\alpha_{1b}).(\upsilon-\gamma).(E(1/\emptyset))^2/\lambda \quad \text{(A21)}$$

The above expression will be negative if:

$$(\alpha_{1a}-\alpha_{1b}).(\upsilon-\gamma) < 0 \quad \text{(A22)}$$

We assume that this condition is satisfied, and hence a perfect Bayesian Nash Equilibrium exists. To see its implications, notice that the first term in the above expression measures the difference between the marginal utilities of the two public

goods to the boss, while the second term measures the marginal utilities of the two public goods the principal. In essence, the negativity of the above expression implies that there is a difference between the preferences of the boss and the legislator with regard to the two types of public goods.

Proposition 4

This follows from using the derivative of (A16) with respect to k_1:

$$\partial B^*/\partial k_1 = -\lambda(\upsilon - \gamma)/(v - \gamma).(\alpha_{1a} - \alpha_{1b}).(E(1/\phi))^2 \qquad \text{(A23)}$$

The denominator is negative by assumption. Thus the above expression is $>(<) 0$ as $\upsilon > (<) \gamma$ implying an increase (decrease) in the budget as long as $\upsilon > (<) \gamma$.

Corollary

This result follows from (A17) with respect to k_1:

$$\partial Q^*/\partial k_1 = -\lambda(\upsilon - \gamma)/(v - \gamma).(\alpha_{1a} - \alpha_{1b}).(1/\phi).(E(1/\phi))^2 \qquad \text{(A24)}$$

As the denominator is negative, the above expression is $>(<) 0$ as $\upsilon > (<) \gamma$ implying an increase (decrease) in the composite public output as long as $\upsilon > (<) \gamma$.

Proposition 5

It is straightforward to see from equations (A16) and (A17) that $\partial Q^*/\partial\omega < 0$ and $\partial B^*/\partial\omega < 0$ holds. Differentiating (A18) with respect to ω yields:

$$\partial k^*/\partial\omega = 1/2.(v - \gamma).E(1/\phi) \qquad \text{(A25)}$$

Since the sign of $\partial k^*/\partial\omega$ depends on the sign of $(v - \gamma)$. If $\upsilon > (<) \gamma$ it yields $\partial k^*/\partial\omega > (<) 0$.

Appendix B

Modeling the subordinate's policy preferences and identity

We set up a game-theoretic model in which the subordinate also has policy preferences which are embedded in his identity. We show that even if the subordinate has his own identity stance, this will have no impact on the equilibrium values as long as the boss controls the allocation policy. For analytical tractability we draw our attention to a 2-person simultaneous move game in which the budget of the bureaucracy is treated as exogenously given.

The boss is assumed to derive utility from the two public goods on offer and has an insider identity. He pursues the organizational goal k_1. The utility function of the boss can be written as:

$$U_1(k; Q, k_1) = \alpha_{1a}.(k.Q) + \alpha_{1b}.((1-k).Q) - \lambda.(k-k_1)^2 \qquad \text{(B1)}$$

The subordinate's utility function also depends on the two public goods. His identity is captured by the identity parameter ρ and his organizational goal k_2. The subordinate as the implementer of the policy derives utility from budgetary slack[4]. The utility function of the subordinate can be specified as:

$$U_2(Q; k, B, k_2) = \mu_{2a}.(k.Q) + \mu_{2b}.\big((1-k).Q\big) - \rho.(k-k_2)^2$$

$$+a.(B-\phi.Q) - b.(B-\phi.Q)^2 \qquad \text{(B2)}$$

The two players play a simultaneous move game in which the boss chooses the budgetary allocation policy k while the subordinate chooses the size of the composite public good Q. Both players have their own identities k_1 and k_2.

Nash Equilibrium

A Nash equilibrium of the game can be defined as a pair (k^*, Q^*) such that:

$$k^* = \text{argmax}\, U_1(k; Q^*, k_1) = \alpha_{1a}.(k.Q^*) + \alpha_{1b}.\big((1-k).Q^*\big)$$

[4] For simplicity utility from budgetary slack is assumed to be quadratic.

$$-\lambda.(k-k_1)^2 \quad \text{(B3)}$$

$$Q^* = \text{argmax}\, U_2(Q;k^*,B,k_2) = \mu_{2a}.(k^*.Q) + \mu_{2b}.\big((1-k^*).Q\big)$$

$$-\rho.(k^*-k_2)^2 + a.(B-\phi.Q) - b.(B-\phi.Q)^2 \quad \text{(B4)}$$

To derive the Nash equilibrium the following optimization problems need to be solved:

Optimization problem of the boss

The boss chooses the budgetary allocation policy that maximizes his utility.

$$\text{Max}_{\text{k}}\, U_1(k;Q,k_1) = \alpha_{1a}.(k.Q) + \alpha_{1b}.\big((1-k).Q\big) - \lambda.(k-k_1)^2 \quad \text{(B5)}$$

The optimal budgetary allocation policy solves the following first order condition:

$$\partial U_1/\partial k = (\,\alpha_{1a} - \alpha_{1b}).Q - 2\lambda.(k-k_1) = 0 \quad \text{(B6)}$$

The above equation can be solved as:

$$k = [(\alpha_{1a} - \alpha_{1b})/2\lambda].Q + k_1 \quad \text{(B7)}$$

Equation (B7) shows that the best response of the boss depends on the level of the composite public good as well as his organizational goal. Any change of the organizational goal will be translated to an equivalent change in the budgetary allocation policy. The best response of the boss to changes in the level of the composite output depends on the relative marginal utilities of the boss from the two public goods. An increase in the level of composite output will prompt the boss to increase the budgetary allocation towards Q_a or (Q_b) if the boss' marginal utility from Q_a is greater (less) than that of Q_b.

Optimization problem of the subordinate

The subordinate chooses the level of composite public good that maximizes his utility:

$$\text{Max}_{\text{Q}}\, U_2(Q;k,B,k_2) = \mu_{2a}.(k.Q) + \mu_{2b}.\big((1-k).Q\big) - \rho.(k-k_2)^2$$

$$+a.(B-\phi.Q)-b.(B-\phi.Q)^2 \quad \text{(B8)}$$

The optimal level of the composite output solves the following first order condition:

$$\partial U_2/\partial Q = \mu_{2a}.k + \mu_{2b}.(1-k) - a\phi + 2b\phi.(B-\phi Q) = 0 \quad \text{(B9)}$$

Straightforward algebraic manipulation yields:

$$Q = (\mu_{2b} - a\phi)/2b\phi^2 + [(\mu_{2a} - \mu_{2b})/2b\phi^2].k + (1/\phi).B \quad \text{(B10)}$$

Equation (B10) reveals that the best response of the subordinate depends on the budgetary allocation policy and the level of budget. Thereby the identity of the subordinate plays no role for determining the optimal choice of the composite output. This is because the subordinate takes the budgetary allocation policy as given while maximizing his utility. Therefore, the optimal response of the subordinate is determined independently of his organizational goal. Second, an increase in the budgetary allocation policy towards Q_a will induce an increase in the level of composite output as long as the marginal utility of the subordinate from Q_a exceeds that from Q_b. Otherwise, an increase of the budgetary allocation policy towards Q_a will lead to a lower level of composite public output. An increase of the level of budget will lead to an increase of the level of the composite public output along the optimal path of the subordinate.

The equilibrium values of the budgetary allocation policy and the composite public output can be derived from solving equations (B7) and (B10) for k^* and Q^*. While these detailed derivations can be solved, some observations can be made already without having the explicit solutions. For example, the equilibrium values will depend on the level of the budget of the bureaucracy and the organizational goal of the boss. How the equilibrium values will respond to changes of the variables depends on the relative magnitudes of the marginal utilities of the boss and the subordinate for the two types of public goods.

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