Building Effective Bureaucracy: Career Concerns, Productivity, and Politicization in the Public Sector

Modern democratic governance depends fundamentally on the capacity of bureaucracy. Democracies rely on large bureaucracies to recommend policies and put them into effect. Some governments have designed systems that are effective at recruiting, developing and retaining expert public sector officials. Other governments have more difficulty staffing the government with the best and brightest and the state is lethargic and politicized. In this paper we present a model of government bureaucracy that tries to explain these different outcomes. It models the design of civil service systems when potential employees have different productivity levels and career concerns in the public or private sector. It illuminates the trade-off between political intervention and agency productivity in the design of this system. The model explains how the selection of public sector wages for clerks and managers and the degree of politicization determines whether governments have low or high capacity. It does so in the context of constraints posed by existing labor markets and binding fiscal pressures. In addition, the model shows how wage compression in the public sector - a stylized fact where government pays clerks better than the private sector and pays managers less than in the private sector - may be a strategic choice to keep unproductive employees from becoming managers. If externally imposed, however, a minimum wage for the clerks or a maximum wage for the managers may force the agency out of the equilibrium that maximizes politicians' objectives.

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Comments welcome

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Modern democratic governance depends fundamentally on the capacity of bureaucracy. Given the immense scope and complexity of government action, democracies rely on large bureaucracies to recommend policies and put them into effect (Weber 1946). The ability of government agencies to set policy in complex areas like monetary policy, telecommunications, and public health depends fundamentally on building an expert civil service (Huber and McCarty 2006). If administrative officials fail to recruit and develop a robust public workforce, this can have immense consequences for the success of democracy itself. Governments with effective bureaucracies have tended to have higher economic growth and greater democratic stability (see e.g., Evans and Rauch 1999; Fukuyama 2014; Rauch and Evans 2000).

Despite the importance of the bureaucracy, the process of designing one is fraught with difficulty. Elected officials must compete with the private sector for talent, induce this talent to become expert, and ensure that the actions of bureaucrats are consistent with the wishes of political bosses (see, e.g., Cameron and de Figueiredo 2019; Cameron et al. 2020; Gailmard and Patty 2007; Moe 1989). And, elected officials often confront severe budget constraints and thin labor markets. Some governments have designed systems that are effective at recruiting, developing and retaining expert public sector officials (Dahlstrom and Lapuente 2017). Other governments have more difficulty staffing the government with the best and brightest and the state is lethargic and politicized. What explains the difference?

In this paper we present a model of government bureaucracy that attempts to answer this question. It models the design of a public sector wage and promotion schedules and politicization levels when potential employees have different productivity levels and career concerns either in the public or in the private sector. It illuminates the trade-off between political intervention and agency productivity in the design of this system. The main implications of the model differ depending upon the features of the labor market. In a market where the proportion of productive employees is low,

the optimal design selects only low-productivity employees, incentivizes them to become managers but maintains high levels of political control. This results in a low wage and low productivity bureaucracy that only implements projects that favor the boss. In a market where the proportion of productive employees is high, there may be two optimal designs. Both designs involve hiring all kinds of employees (both low and high productivity). When the difference in productivity between employees in society is high, the optimal design leads to systems that only promote the more productive employees to managers, while keeping the less productive employees in clerk positions. Conversely, when the difference in productivity is low, then the optimal design incentivizes both more and less productive employees to become managers.

In total, the model helps explain variation in state capacity among governments. It explains how the selection of public sector wages for clerks and managers and the degree of politicization determines whether governments have low or high capacity bureaucracies. Of course, these choices happen in the context of constraints posed by existing labor markets and fiscal pressures which importantly shape what is possible. In addition, the model shows how wage compression in the public sector - a stylized fact where government pays clerks better than the private sector and pays managers less than in the private sector - may be a strategic choice of the agency designer to keep unproductive employees from becoming managers. If externally imposed, however, a minimum wage for the clerks or a maximum wage for the managers may force the agency out of the equilibrium that maximizes the boss' objectives.

Building a High Capacity Civil Service

Building a high capacity administrative state is importantly a question of personnel economics—how the government sets policy to recruit, develop and retain the personnel that operate the machinery of democracy. This is harder or easier at different times depending upon the

composition of the labor market, competition from other employers for entry level workers and managers, the choices of the politicians building the system, and the complexity of problems the bureaucracy must solve. The research on personnel economics is voluminous and provides a foundation of what is to follow (Grund et al. 2017; Lazear and Gibbs 2014; Lazear and Oyer 2012). Yet, there are a number of features of the public sector that make it a distinctive context for employment. First, expertise is often agency specific and internally developed (Bertelli and Lewis 2013; Gailmard and Patty 2007; Wilson 1989). Since government is often a monopoly provider of a good or service, the skills and expertise required for government work can only be acquired through costly training rather than hiring. Second, electoral or political calculations drive public sector decision making rather than the market (McCarty 2004, McCubbins, Noll, and Weingast 1989, Moe 1984). Public sector bosses determine wage structures and levels of auditing on the basis of political interest rather than profit. Indeed, a common feature of public sector personnel systems is pay compression relative to the private sector, perhaps due to political pressure to provide fair wages on the low end or keep executive pay within bounds in the high end.[1] Auditing rates, too, can reflect the political interest of the boss more than larger concern for organizational productivity (Lewis 2008, Moe 1985, Nathan 1975).

[1] Scholars observing a public sector pay gap note that is most pronounced at lower levels and in developing countries (Depalo et al. 2015; Finan et al. 2017; Krueger 1988). This public sector pay premium is generally smaller in more developed countries and in some cases the pay gap reverses, with the public sector executives being paid less than their private sector counterparts (Borjas 2002; Gindling et al. 2020). Other explanations for the pay gap include the possibility that government jobs are more complex than private sector jobs, outside actors capture the public sector and inflate wages, or that public sector workers are paid more to deter corruption (Finan et al. 2017).

Two recent works make important advances tying these various threads together. They integrate personnel economics with government policy making, drawing out implications for state capacity. Gailmard and Patty (2007, 2013) develop a model of bureaucratic policy making that involves a legislature, policy making, and the career concerns of a bureaucrat. The legislature decides on the amount of policy making discretion given to a bureaucrat. The bureaucrat decides whether to expend effort to become expert and chooses a policy (within the range of discretion provided by the legislature). The bureaucrat then decides whether to stay in public service for another period. The authors use the model to illustrate how policy discretion is a form of compensation that the legislature can give bureaucrats to induce them to become expert and stay in public service. Policy motivated bureaucrats will accept less pay in exchange for the policies they prefer. Civil service protections, they reason, can induce civil servants to acquire expertise and stay in public service even if outside compensation is higher.

Cameron et al. (2020) build on Gailmard and Patty and model the personnel economics surrounding the policy making process more fully. Notably, in a complex setup, they model the choice of potential employees to *enter* public service, the decision whether to invest in expertise, and the boss's promotion decision. The authors also model the promoted employee's effort level to find good projects and whether the projects will be approved or rejected by a political boss. Ultimately, Cameron et al. (2020) are interested in choices by political actors in a first stage of the model to set wage schedules, promotion thresholds, and levels of politicization in order to secure the best outcomes for political officials. They demonstrate that optimal wage schedules and politicization levels depend in part on the labor markets for different kinds of agencies, what they call Type I (no outside market for acquired skills) and Type II (robust market for acquired skills) agencies. For Cameron et al. there is a key tradeoff between control and the willingness of employees to enter public service, invest in expertise, and stay, particularly in Type II agencies.

We build on these models, particularly Cameron et al. (2020), and make three new contributions. First, both recent models depend upon assumptions about whether employees value wages (slackers) or policy (zealots). While the intrinsic motivations of employees differ in important ways, an equally important distinction is the varying capability among workers.[2] Some employees are high capacity types. They find training easier and they find the work they do after training simpler. They expend less effort to become expert and they have less trouble proposing good projects and solving hard problems once they get into positions of responsibility. Other workers are less naturally gifted or less well prepared going into the labor market (e.g., geographic regions with few higher education opportunities). These lower capacity workers have to expend significant personal effort to become experts and they have a more difficult time coming up with good programs or solutions to agency problems once they get into positions of responsibility.

Second, our model includes a more porous public sector labor market that better reflects the reality government agencies face, namely the employee has three decision points with regard to the public service: 1) whether to enter the private or public sector to start, 2) whether to stay or leave after a period as a clerk in government, and 3) whether to stay or leave after becoming a manager (after expertise investment). This helps us illuminate key features of modern civil service systems, namely pay compression in the public sector versus the private sector. Our model illustrates how wage compression can emerge endogenously as a way for the agency designer to keep unproductive employees from becoming managers. While common explanations for wage compression point to union pressure or efficiency wages, we suggest that wage compression can help system designers

[2] Cameron et al. (2020, 142) discuss the possibility of variation in capacity at the end of their paper. They introduce the possibility that high and low capability may be correlated with whether an employee is a slacker or a zealot and suggest this as a fruitful avenue for future research.

ensure that only the most competent get promoted (Johnson and Libecap 1994; Finan et al. 2017; Moe 2006). We also include a discussion of how externally imposed minimum wages for the clerks or maximum wages for the managers may force the agency out of the equilibrium that maximizes the boss' objectives.

Finally, while other models focus primarily on whether employees stay, become expert, and set welfare enhancing policies, we focus here on whether agencies are productive. Do managers recommend projects and are the projects that political bosses will accept? Cameron et al. (2020) include a similar technology in their model but we draw out its implications more fully here.

Basic Model of Public Sector Employment

There are two players, a boss (B) of a public agency (A) and a potential employee (E) that can be a clerk or (eventually) a manager in the public or private sector.[3] We might understand the boss to be a political appointee and the employee a civil servant. The boss wants to implement policies that increase her own wellbeing which, for simplicity, we call "good" or "favorable" policies hereafter. A good policy for the boss is a policy that rewards her with a positive payoff, which could be seen as an electoral reward, political popularity or even her personal feeling of satisfaction for implementing what she believes to be a beneficial policy. We note, however, that what is good for the boss does not necessarily have to be "good" in some more general sense such as what voters want or a policy that provides overall social welfare. What is good for the boss could also simply be pork, patronage, or corruption.

[3] Using the Principal-Agent framework, the boss would be the Principal and the potential employee the Agent.

Being a politician rather than a technical staff, the boss does not know how to design a policy. For that task, she must delegate policy search to an expert manager, which, in a well-designed system, will be the employee (E) that has been promoted to be a manager.

There are two periods. In period 1, the employee (E) decides whether to start a private sector or a public sector career. In either case, he works as a clerk in period 1. The respective first period wages are $s_c > 0$, the exogenously given private sector's clerk wage, or $w_c > 0$, the public sector's clerk wage.

If the employee decides to work in the public agency A, he may choose to invest in acquiring expertise to become a public sector manager. Expertise acquisition is a costly endeavor and causes a utility cost to the agent. The agent may be of two types $j = p, n$. The (more) productive type $j = p$ faces a lower expertise acquisition cost $c_p > 0$; the unproductive (less productive) type $j = n$ faces a higher expertise acquisition cost $c_n > c_p$. The ex-ante probability that the agent is productive is $\lambda \in [0,1]$.

If the employee (E) does not acquire expertise, he may choose to remain in the public sector as a clerk in period 2, earning the same income w_c, or move to the private sector where he will earn the clerk's salary s_c. If, on the other hand, the employee has acquired expertise, he will be promoted to manager and he can decide to move to the private sector and earn the clerk's wage s_c, or stay in the agency as a manager in period 2 and earn the manager's wage $w_m > 0$. The boss receives the basic clerk's work return v whenever the employee works as a clerk. Note that our modeling approach implicitly assumes that public sector expertise is not valued in the private sector. This assumption differs from Cameron et al. (2020) and is made here to focus on the incentives an employee may have to follow a public career *per se*, rather than as a stepping stone to a private sector career. We leave as a suggestion for future research the extension of the model to that alternative framework.

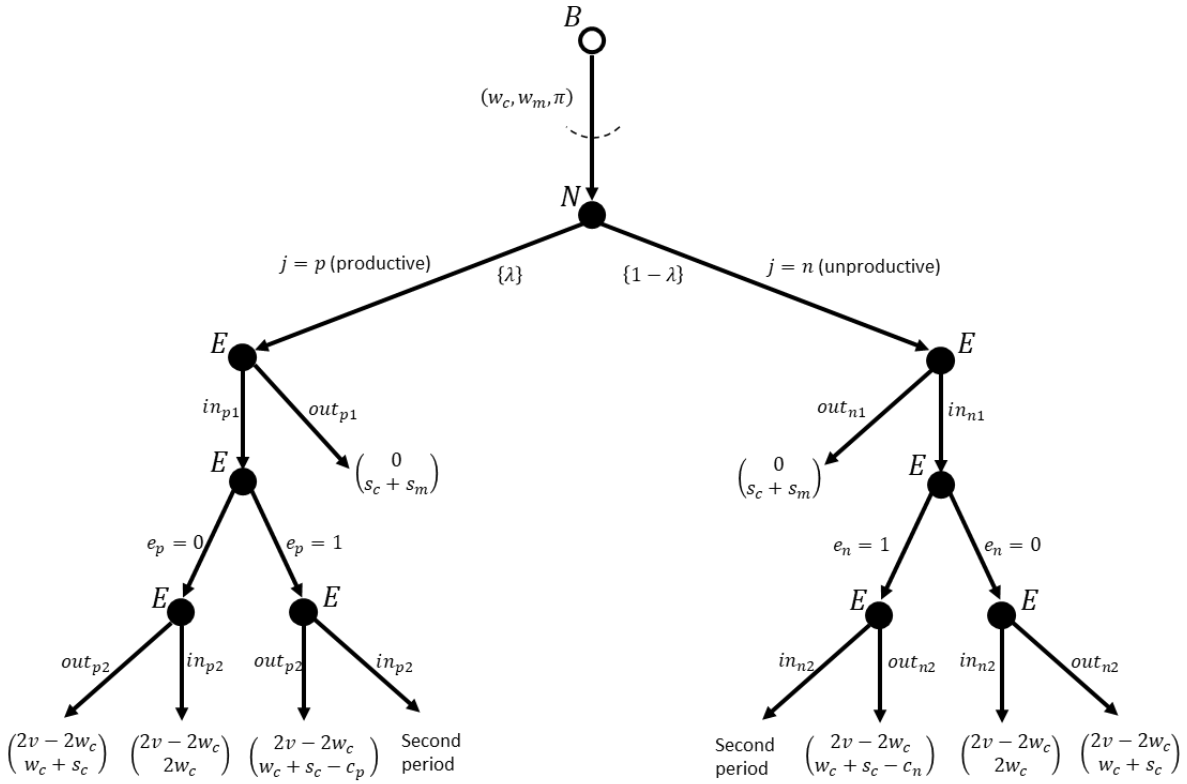
The role of a manager is to search for a policy to be proposed to the boss. These can be understood as solutions to existing or new problems, innovations, or more mundanely grants, contracts, investigations, etc. A policy may be of two types regarding the return it generates to the boss. A good or favorable policy generates the high return $Y_H > 0$ to the boss whereas a bad or unfavorable policy yields the negative return $Y_L < 0$. The policy search that is conducted by the manager is a stochastic process and it is successful, i.e., yields the positive return Y_H, with probability $a_j, j = p, n$ where $1 > a_p > a_n > 0$. Therefore, the unproductive employee not only faces a higher cost for expertise acquisition, he also finds a favorable policy with a lower probability than the productive agent.

When the search process concludes, only the manager observes the policy's type and decides whether to recommend it to the boss. If the manager decides not to recommend the policy, then no policy is implemented, and neither the agent nor the principal receive any additional, policy-related, benefit. If the manager decides to recommend the policy, the boss chooses whether to audit it. The goal of auditing is to determine if the policy is favorable or unfavorable, i.e., the policy's type. Auditing reveals the policy's type with probability $\pi, \pi \in [0,1)$. The parameter π reflects the level of intervention in or the level of politicization of the agency, and it is a choice the boss makes on the agency design. An agency with a low π is an institution with little intervention like an independent commission or an executive agency with no political staff. An agency with a high π suffers high intervention. The boss can choose a null level of politicization, not auditing at all on a proposed policy. In that case, since the boss cannot determine the policy's type, we identify the situation with a zero probability of success auditing, , $\pi = 0$, for simplicity. Furthermore, we assume that the boss is unable to assess with probability 1 the policy outcome ($\pi < 1$).

After observing the result of the auditing report (e.g., a review by political staff), which may be informative (with probability π) or uninformative (with probability $1-\pi$), the boss decides whether to implement the recommended policy. If the policy is implemented, it generates the corresponding payoffs (Y_L or Y_H) to the boss. It also generates the career (reputation) reward to the manager described next. If there is no auditing (i.e., $\pi = 0$) or the auditing does not reveal the policy's type, the manager receives the highest career reward, $R > 0$. If the auditing reveals a favorable policy, the manager receives the second best career reward $S, 0 < S < R$. The difference between payoffs R and S can be interpreted in different ways. It can reflect the fact that the implemented policy is widely perceived as the full responsibility of the manager when the auditing does not reveal its type, whereas it is seen as a shared responsibility between the manager and the boss when its type is revealed. It can also reflect the autonomy or satisfaction of the manager at not being micromanaged by a political boss. Finally, if the auditing reveals an unfavorable policy, it will not be implemented, and the manager will be punished (for recommending an unfavorable policy) with the utility cost $-p, p > 0$.

A productive employee is productive both in the public and in the private sector. If the employee decides to work in the private sector, by the end of period 1 he is promoted to private sector manager. We assume that the private sector is able to determine the type of the agent, so that the type $j = p, n$ manager earns wage $s_{m_j} > s_c$ in period 2 in the private sector, where $s_{m_p} > s_{m_n}$. The private sector wages s_c and s_{m_p} or s_{m_n} represent the employee's (E) net utility when he works in the private sector.

Figure 1. Extensive Form of Agency Design Game



Note: Figure 1 presents the corresponding general extensive form of the two-period game played by the boss (B) and the potential employee (E). The second period subgame is presented in more details in Figure 2.

The game starts with the boss (B) designing the agency's wage schedule (w_c, w_m) and the politicization (intervention) level (π). Then, Nature (N) selects the potential employee who will consider working for the boss. The agent is productive (p) with probability λ and unproductive (n) with probability $1 - \lambda$. Next, the employee decides either to work in the private sector ($out_{j1}, j = p, n$) or to work in the agency initially as a clerk (in_{j1}). If the employee enters the agency, he decides whether to acquire expertise ($e_j = 0, 1$). If he does not acquire expertise, the employee decides either to stay as a clerk in the agency (in_{j2}) or to transfer to the private sector (out_{j2}). Finally, if the employee acquires expertise, he decides whether to transfer to the private sector (out_{j2}) or to stay (in_{j2}) for a second period in the agency as a manager and play the policy search subgame with the boss.

Figure 2 depicts the details of the second period policy search and implementation subgame. In the second period, the boss believes she is dealing with a productive manager with probability θ, and with an unproductive manager with the complementary probability $1-\theta$. The parameter θ corresponds to the boss' updated beliefs given the first period play, about the type of the manager. In particular, if the boss learns that only the productive employee becomes a manager, then $\theta = 1$; similarly, if both types of agents enter the agency and become managers, then $\theta = \lambda$.

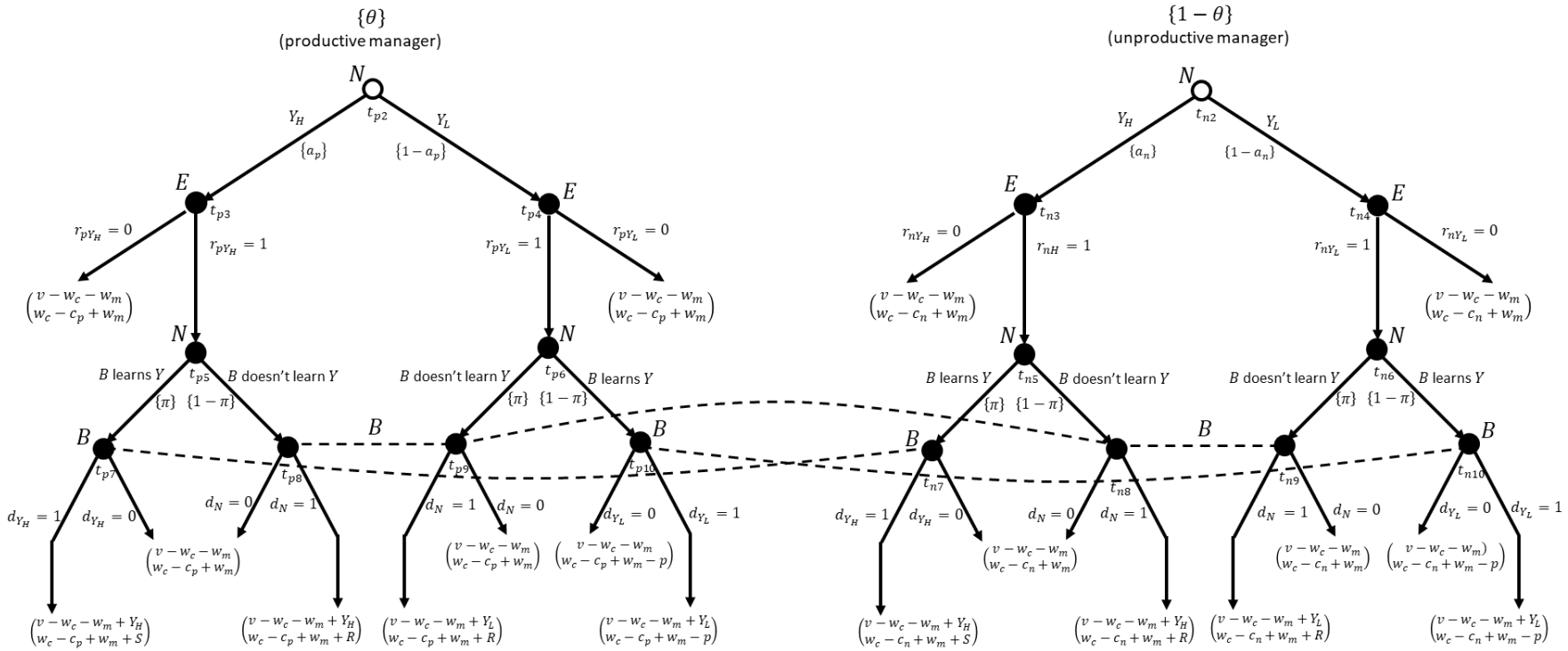
The manager $j = p, n$ searches for a policy and is able to find a favorable policy with probability a_j. The manager observes the policy type and decides whether to recommend it to the boss or not (t_{j3}, t_{j4}). If he does not recommend the policy, the game ends with the payment of the management wage w_m. If he recommends the policy (t_{j5}, t_{j6}), then the auditing/monitoring process reveals the true policy type with probability π. The boss, then, observes the result of the audit and decides whether to implement that policy. If the boss decides not to implement the policy, she receives no policy-related utility in period 2, pays the manager's wage w_m, and the manager receives his wage. If she implements the recommended policy, the boss receives the realized value of $Y \in \{Y_H, Y_L\}$ and the employee receives the career/reputation return $S > 0$ if the decision to implement comes after as successful audit, or $R > S > 0$ if the boss' decision is taken without knowing the real future benefit of the policy. Finally, the manager receives a punishment $-p$, $p > 0$ if the boss finds out that the policy is unsuccessful by means of the audit mechanism.

In order to have a nontrivial interaction between the boss and the employee, the boss must be sufficiently damaged by an unfavorable policy and there must be enough difference in the managers' productivities. The following technical assumptions ensure that the interaction between the boss and the employee is nontrivial: (i) $-Y_L > p + R > p + S$; (ii) $a_p \geq \frac{-Y_L}{\Delta Y} > a_n$; (iii) $a_p >$

$\frac{p(R+Y_L)+R(R+Y_L)}{p(R+Y_L)+R(S+Y_L)} > \frac{p+R+Y_L}{p+S+Y_L} > \frac{(p+R+Y_L)-\lambda(a_p-a_n)Y_L}{p+S+Y_L}a_n$; (iv) $c_n - R > 0$, but $c_n - R < \frac{s_{m_p}-s_c}{2}$:

Condition (i) establishes that a bad policy has a considerable damaging power, which is higher than the net benefits of policy implementation to the managers; otherwise the manager would be able to "buy out" the boss to accept implementing any policy. Conditions (ii) and (iii) ensures that, on one hand, the benefits to the boss engendered by a productive manager are high compared to the relative cost of implementing a bad policy and, furthermore, the productive and unproductive managers are sufficiently distinct in their ability to produce good policies; otherwise, the employees would be essentially undistinguishable from the point of view of the boss. Finally, condition (iv) establishes that the cost of acquiring expertise is higher than the benefits of passing a policy but not exceedingly higher. Otherwise, the employee would either have no need of any incentive to acquire expertise or, on the other extreme, would prefer not to enter the public sector and exclusively follow a private sector career.

Figure 2. Second Period Policy Subgame



Second Period Subgame Solution

We are looking for pure-strategy Perfect Bayesian Equilibria. Therefore, we start looking at the second period game and move backwards. By the beginning of the second period game, one of two things may have happened. Either both types of agents entered and became managers, in which case the boss plays an incomplete information game with the agent where $\theta = \lambda$, or only one type of agent has become a manager, in which case the boss plays a complete information game with the manager where either $\theta = 0$ (less productive manager) or $\theta = 1$ (more productive manager). We solve the game in Figure 2 by Sequential Rationality and Bayesian Consistency.

We find two possible equilibria, described in Proposition 1. The equilibria calculations are presented in Appendix A.I.

Proposition 1. *In the second-period policy search game between the boss and manager, there may be two equilibria:*

(i) A low-politicization equilibrium may exist if the expected productivity of the manager is high enough $\left(\theta a_p + (1-\theta)a_n \geq -\frac{Y_L}{\Delta Y}\right)$. *In that case, the politicization level is low* $\left(\pi \leq \frac{R}{p+R}\right)$. *The Perfect Bayesian equilibrium strategy profile is:*

$$\left(\left(r_{jY_H} = 1, r_{jY_L} = 1, j = l, h\right), \left(d_{Y_H} = 1, d_n = 1, d_{Y_L} = 0\right), \mu = \theta a_p + (1-\theta)a_n \geq -\frac{Y_L}{\Delta Y}\right)$$

In that equilibrium the manager always recommends the policy no matter its type, and the boss always implements a recommended policy if the auditing process does not reveal it is an unfavorable policy.

(ii) A high-politicization equilibrium always exists with a high level of politicization $\left(\pi \geq \frac{R}{p+R}\right)$. *The Perfect Bayesian equilibrium strategy profile is:*

$$\left(\left(r_{jY_H} = 1, r_{jY_L} = 0, j = l, h\right), \left(d_{Y_H} = 1, d_n = 1, d_{Y_L} = 0\right), \mu = 1\right)$$

In that equilibrium the manager only recommends favorable policies, and the boss always implements a recommended policy.

Proof. See Appendix A.I.

Table 1 presents the equilibria and corresponding payoffs of the players. The logic behind the two possible equilibria hinges on the benefits and the costs of politicization. A higher level of politicization increases the likelihood that auditing reveals a bad policy, if recommended. In that case, the manager is punished. Therefore, the manager prefers not to recommend bad policies. But then, the expected benefit of being a manager -which the manager only receives when his recommended policies are implemented- reduces. Therefore, the boss needs to increase wages to compensate the lower expected benefit of the manager. The boss will find it optimal to do so when he believes the manager is more likely to be unproductive. Conversely, if the boss believes the manager is more likely to be productive, then the chances of a bad policy being proposed reduces. Therefore, the Boss prefers to reduce the auditing effort and, thereby, reduce the manager's wage accordingly.

Table 1. Expected Utilities for Each Possible Second Period Perfect Bayesian Equilibria

Equilibrium type	1: Low Control: $\pi \leq \frac{R}{p+R}$	2: High Control: $\pi \geq \frac{R}{p+R}$
Productive type frequent: $\theta a_p + (1-\theta)a_n \geq -\frac{Y_L}{\Delta Y}$	$\begin{pmatrix} (r_{jY_H} = 1, r_{jY_L} = 1, j = l,h), \\ (d_{Y_H} = 1, d_n = 1, d_{Y_L} = 0), \\ \mu = \theta a_p + (1-\theta)a_n \geq -\frac{Y_L}{\Delta Y} \end{pmatrix}$	$\begin{pmatrix} (r_{jY_H} = 1, r_{jY_L} = 0, j = l,h), \\ (d_{Y_H} = 1, d_n = 1, d_{Y_L} = 0), \\ \mu = 1 \end{pmatrix}$
Productive type uncommon: $\theta a_p + (1-\theta)a_n < -\frac{Y_L}{\Delta Y}$	Does not exist	$\begin{pmatrix} (r_{jY_H} = 1, r_{jY_L} = 0, j = l,h), \\ (d_{Y_H} = 1, d_n = 1, d_{Y_L} = 0), \\ \mu = 1 \end{pmatrix}$
Employee's decision	Recommends all policies, favorable or unfavorable	Recommends only favorable policies
Boss' decision when audit fails	Implements the recommended policy	
Boss' net policy expected payoff $EU_B(\pi, 2, \theta)$	$(\theta a_p + (1-\theta)a_n)Y_H$ $-(1-\pi)(-Y_L)\left(1-(\theta a_p + (1-\theta)a_n)\right)$	$(\theta a_p + (1-\theta)a_n)Y_H$
Boss' expected payoff $EU_B(\pi)$	$(\theta a_p + (1-\theta)a_n)Y_H$	$(\theta a_p + (1-\theta)a_n)Y_H$

	$-(1-\pi)(-Y_L)\left(1-\left(\theta a_p+(1-\theta)a_n\right)\right)$ $+v-w_c-w_m$	$+v-w_c-w_m$
Employee's net career expected payoff $EU_E(\pi;j,2), j=p,n$	$-\pi\left[(p+R)-a_j(p+S)\right]+R$	$-\pi a_j(R-S)+a_jR$
Employee's expected payoff $EU_E(\pi;j), j=p,n$	$-\pi\left[(p+R)-a_j(p+S)\right]+R$ $+w_c-c_j+w_m$	$-\pi a_j(R-S)+a_jR$ $+w_c-c_j+w_m$

First Period Solution: Optimal Wage Schedule

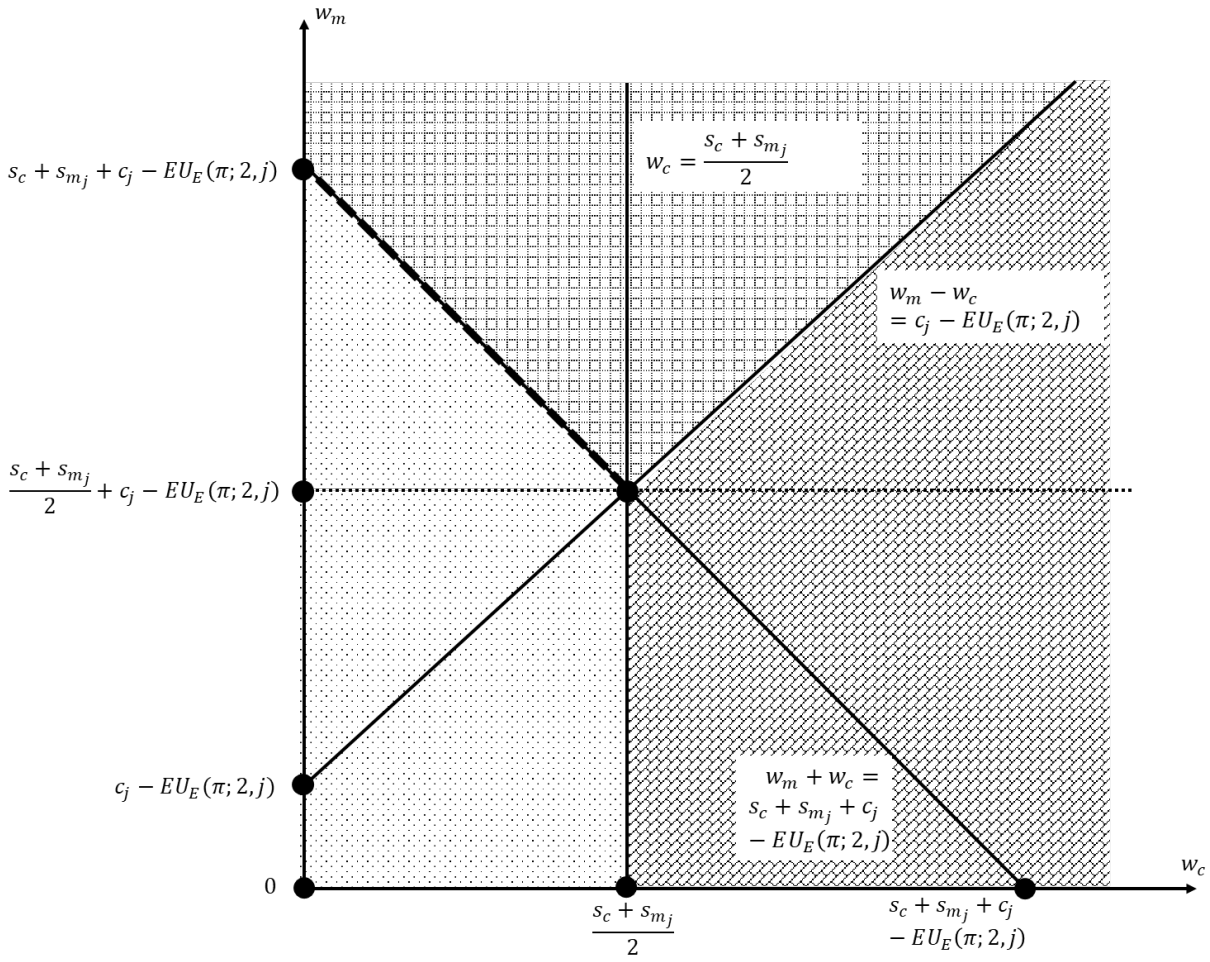
If we fix a politicization level π, then for each wage schedule (w_c, w_m), the potential employee faces 5 choices: (i) do not enter the agency (work in the private sector); (ii) enter the agency, do not acquire expertise and stay in the agency as a clerk in the second period; (iii) enter the agency, do not acquire expertise and leave for the private sector in the second period; (iv) enter the agency, acquire expertise and leave to the private sector; (v) enter the agency, acquire expertise and stay in the agency as a manager in the second period. Some of these choices, however, are strictly dominated strategies. For example, (iii) strictly dominates (iv) and (i) strictly dominates (iii) if the public sector's clerk wage is not higher than the private sector's manager wage. A detailed comparison of these choices is presented in Appendix A.II.

We summarize the best response of the potential employee depending upon the wage schedule (w_c, w_m) for a given politicization level π in Figure 3. The horizontal axis corresponds to the clerk's wage and the vertical axis is the manager's wage. The downward-sloping diagonal line corresponds to the individual rationality constraint, i.e., the agent prefers to enter the agency, acquire expertise and stay as a manager rather than to follow a private sector career for any wage schedule *above* and to the *right* of that line. For wage schedules (i.e., the combination of clerk and managerial wages) below the line, the employee expects either 1) private sector compensation to be higher than their compensation in a public sector career as a manager (including cost of acquiring expertise and expected utility from

searching for and recommending projects) or 2) public compensation as a clerk in the public sector to be higher than their compensation in a public sector career as manager (including cost of acquiring expertise and expected utility from searching for and recommending projects). The upwards-sloping diagonal line corresponds to the most relevant incentive compatibility constraint, i.e., the agent prefers to acquire expertise and stay as manager more than to not to acquire expertise and stay as a clerk in the agency. Wage schedules above the line are cases where the difference in the value of a managerial job versus a clerk job are large enough for the employee to invest in expertise. Finally, the vertical line is the secondary incentive compatibility constraint. To the right of this line the agent prefers to enter, not acquire expertise, and remain as a clerk rather than to follow a private sector career.

The dotted region corresponds to the situations where the employee prefers not to enter the agency at all. The brick-filled area corresponds to the situations where the employee prefers to enter, not acquire expertise, and remain a clerk. Finally, the square-filled region corresponds to the situations where the employee enters, acquires expertise, and stays. The dashed line segment corresponds to all possible implementations of that last choice at a minimum cost to the boss.

Figure 3. Productive Employee's Decision for Each Wage Schedule (w_c, w_m), Given Politicization Level π.



Note: The downward-sloping diagonal line corresponds to the individual rationality condition. The agent prefers to enter the agency, acquire expertise, and stay as a manager rather than to follow a private sector career for any wage schedule *above* and to the *right* of that line. The upward-sloping diagonal and the vertical lines correspond to the incentive compatibility constraints.The dotted region corresponds to the situations where the employee prefers not to enter the agency. The brick-filled area corresponds to the situations where the employee prefers to enter, not acquire expertise, and to remain a clerk. The square-filled region corresponds to the situations where the employee enters, acquires expertise, and stays as a manager.

A complete derivation of the boss' maximization problem when she wished to induce the manager to enter, acquire expertise and stay as a manager is presented in Appendix A.II. The main elements of that solution are summarized in Proposition 2.

Proposition 2. *Consider a hypothetical (complete information) situation where the boss knows the type of the potential employee. Then, given a politicization level* π*, the wage schedule that maximizes the boss' utility and induces that agent to enter, acquire expertise and stay in the agency is any wage schedule* (w_c, w_m) *that satisfies the following condition:*

$$w_c \in \left[0, \frac{s_c + s_{m_j}}{2}\right],\ w_m = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j) - w_c.$$

In particular, the total career wage is: $w_c + w_m = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j), j = p, n$*, which depends on the type of the agent.*

Therefore, the boss compensates the employee for his outside opportunity cost (the private sector's life-time wage $s_c + s_{m_j}$*) and for his expertise acquisition cost* (c_j)*, but extracts all the agent's public sector career expected benefit* $(EU_E(\pi; 2, j))$.

Proof. See Appendix A.II.

Consider now the original situation in which the employee could be of one of two types, the productive employee $j = p$ and the unproductive employee $j = n$. Note at the outset that, given the second period politicization and equilibrium type, the expected career-utility of the more productive manager is at least as high as the unproductive manager: $EU_E(\pi; 2, p) \geq EU_E(\pi; 2, n)$ (see Table 1). Therefore, it must be the case that:

$$c_p - EU_E(\pi; 2, p) \leq c_n - EU_E(\pi; 2, n) \qquad (1)$$

However, since the private sector's manager wage of the productive agent is higher than that of the unproductive agent, i.e., $s_{m_p} > s_{m_n}$, it is not clear which of the two terms below is higher:

$$s_{m_p} + c_p - EU_E(\pi; 2, p) \lesseqgtr s_{m_n} + c_n - EU_E(\pi; 2, n)$$

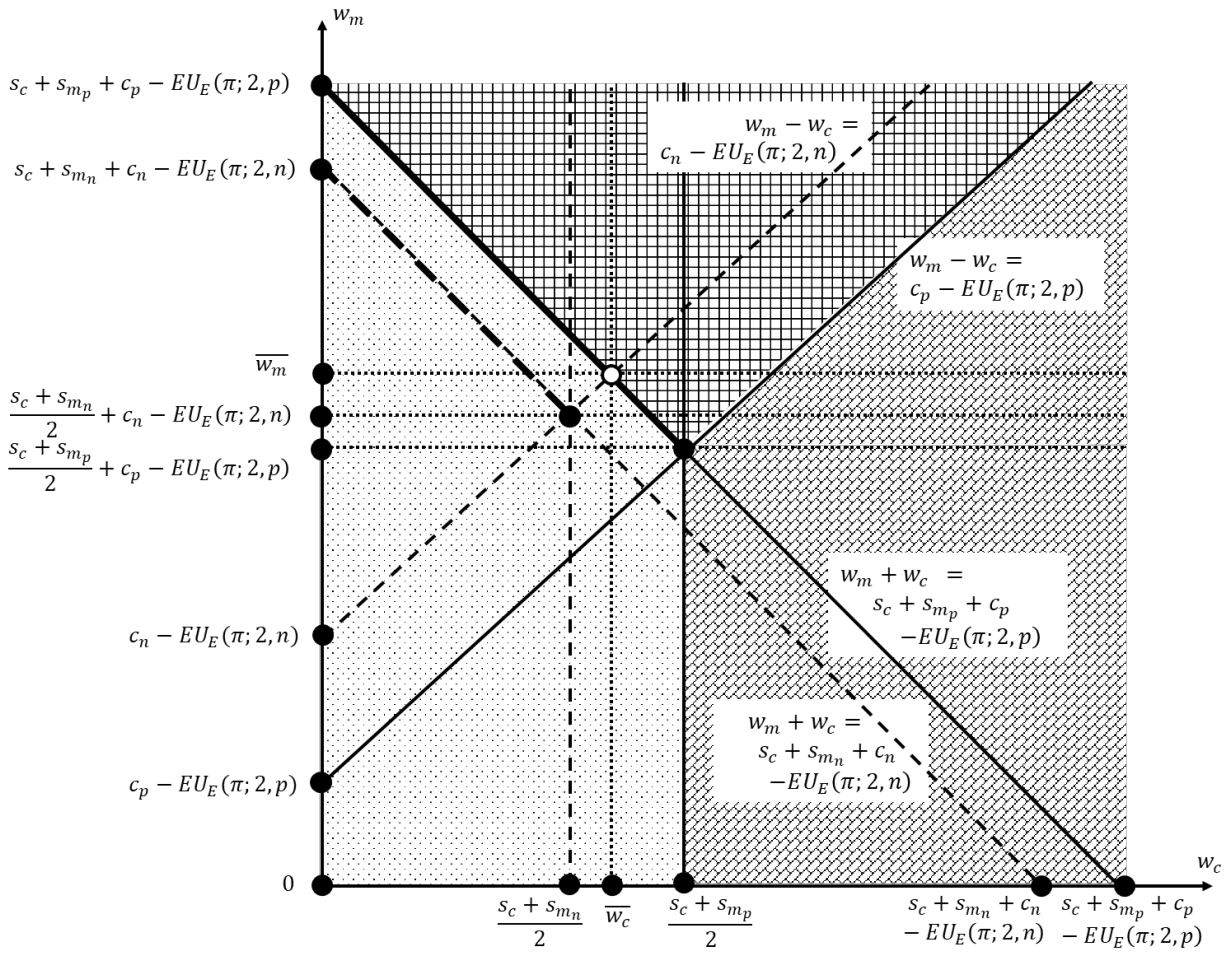
On one hand, if $s_{m_p} + c_p - EU_E(\pi; 2, p) < s_{m_n} + c_n - EU_E(\pi; 2, n)$, we say that the private sector does not strongly value productivity, since the increase in the management wage due to productivity ($s_{m_p} > s_{m_n}$) is not sufficient to reverse the cost inequality (1) when management wages are included. On the other hand, if $s_{m_p} + c_p - EU_E(\pi; 2, p) > s_{m_n} + c_n - EU_E(\pi; 2, n)$, then the productive manager's wage in the private sector is so high that it reverses the inequality (1) when it is included. We say, in this case, that the private sector highly values productivity.

For the sake of concision, hereafter we assume that we are in the case the private sector highly values productivity. This is the most interesting case because this is the situation where the private sector most strongly competes with the public sector. The analysis of the case where the private sector does not strongly value productivity is similar and is available upon request to the authors. When $s_{m_p} + c_p - EU_E(\pi; 2, p) > s_{m_n} + c_n - EU_E(\pi; 2, n)$, the private sector productive manager's wage is so high that the productive manager becomes "costlier to discipline" for the public agency than the unproductive manager.

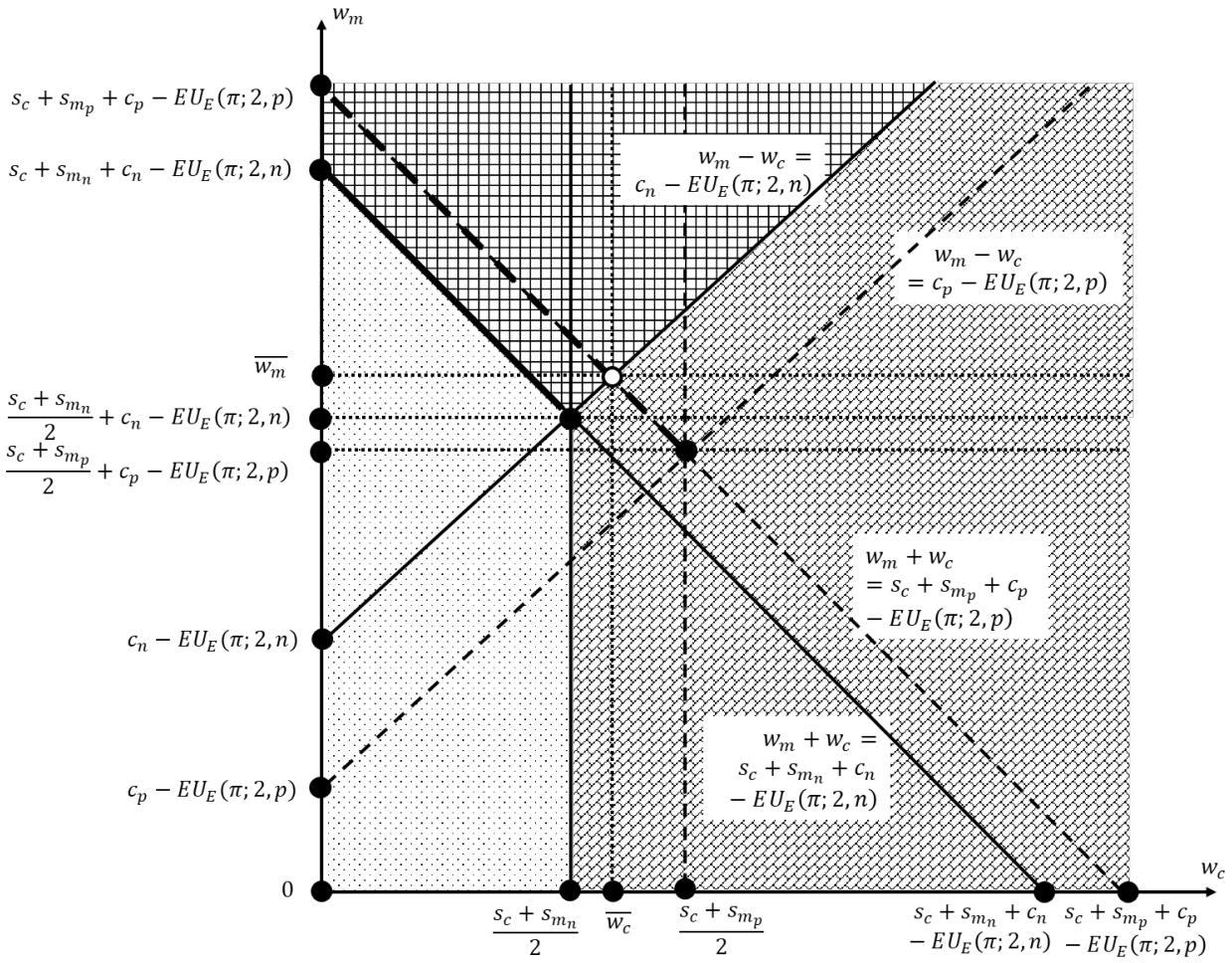
Figure 4 presents the best responses (optimal decisions) of the two types of managers, the more productive (p) and less productive (n), as a function of agency wages and the politicization level. Figure 4 is similar to Figure 3 except that it includes detail distinguishing the two types of employees. As before, if wage schedules (i.e., the combination of clerk and managerial wages) are below the downward-sloping diagonal line, employees will not choose a career as a public sector manager. They will either never enter the agency or enter the agency and stay as a clerk. Only for wage schedules above the upward-sloping diagonal line will employees have an incentive to invest in the expertise necessary to become a manager. Points on the thicker segment of the downward-sloping line(s) reflect the wage schedule that allows the boss to induce the employee to enter the agency, invest in expertise, and stay, for the lowest cost. As the solid downward-sloping line being above the dashed one suggests (and we assume), the costs to the boss are higher for the productive manager than the unproductive manager.

Figure 4. Employee's Decision for Each Wage Schedule (w_c, w_m), Given Politicization Level π and Productivity Highly Valued in Private Sector, by Employee Productivity

(a) The productive manager's decision



(b) The unproductive manager's decision



Note: The dotted region corresponds to the situations where the employee prefers not to enter the agency; the bricks-filled area corresponds to the situations where the employee prefers to enter, not acquire expertise and to remain a clerk; the squares-filled region corresponds to the situations where the employee enters, acquires expertise, and stays as a manager. The continuous (dashed) lines correspond to the type of the manager on focus (other type).

If the boss chooses a wage schedule on the lower dashed line, then the unproductive agent acquires expertise and stays but the productive agent does not even enter the agency as a clerk. On the other hand, if the boss chooses a wage schedule in the upper dashed line, then both productive and unproductive employee types enter. The productive employee also acquires expertise and stays as a manager. However, the choice of the unproductive agent depends on w_c. If $w_c < \overline{w_c}$, i.e., above and to the left of the hollow white dot moving along the solid downward-sloping line, then the

unproductive agent also acquires expertise and becomes a manager.[4] Conversely, if $w_c \in \left[\overline{w_c}, \frac{s_c+s_{m_p}}{2}\right]$, i.e., below and to the right of the hollow white dot on the solid downward-sloping line, then the unproductive agent does not acquire expertise and stays as a clerk (this falls below the upward-sloping line for the unproductive employee). This is a case where the setting of clerk and managerial wages can induce only the most productive employees to become managers. In this case, since the boss will pay $2\overline{w_c}$ when the employee is unproductive, the boss has one unique best response, which is:

$$w_c = \overline{w_c}\,, w_m = s_c + s_{m_p} + c_p - EU_E(\pi; 2, p) - \overline{w_c}.$$

Note that in any equilibrium where both types of agents enter, the binding individual rationality constraint is that of the productive manager, i.e., it must be the case that: $w_c + w_m = s_c + s_{m_p} + c_p - EU_E(\pi; 2, p)$.

In total, the boss has three choices under the present modeling framework. She will design the incentives in such a way that either: (i) Only the unproductive employee enters and becomes a manager; (ii) Both types of agents enter, the productive employee becomes a manager, and the unproductive manager stays as a clerk; (iii) Both types enter, and both become managers. We call the environment (i) the separating equilibrium, environment (ii) the semi-pooling equilibrium and the environment (iii) the fully-pooling equilibrium. The next section determines the optimal politicization level for each one of these possible wage designs.

First Period Solution: Optimal Politicization Level

This section determines the optimal politicization level for each one of the three possible equilibria discussed in the previous section.

[4] Note that $\overline{w_c} = \frac{s_c+s_{m_p}-(c_n-c_p)-[EU_E(\pi;2,p)-EU_E(\pi;2,n)]}{2} \in \left(\frac{s_c+s_{m_n}}{2}, \frac{s_c+s_{m_p}}{2}\right)$.

Separating Equilibrium

In the separating equilibrium only the unproductive employee enters and becomes a manager. The wage schedule will be chosen in such a way that the unproductive agent's individual rationality constraint is active, i.e., $w_m + w_c = s_c + s_{m_n} + c_n - EU_E(\pi; 2, n)$. The boss' problem reduces to:

$$\max_{\pi} \quad v - \left(s_c + s_{m_n} + c_n\right) + EU_E(\pi; 2, n) + EU_B(\pi; 2, n)$$

and this problem is equivalent to:

$$\max_{\pi} \; EU_E(\pi; 2, n) + EU_B(\pi; 2, n).$$

The solution to this problem must consider the two possible politicization environments, the low-control and the high-control cases. These are presented in Appendix A III and Proposition 3 presents the main equilibrium results.

Proposition 3. *Suppose the boss wants to design the agency to maximize her expected return under the restriction that only one type of agent enters, and that agent acquires expertise and becomes a manager. Then, the optimal design will be given by the triplet* (w_c, w_m, π) *where:*

$$\pi = \frac{R}{p+R}; \quad w_c \in \left[0, \frac{s_c + s_{m_n}}{2}\right]; \quad w_m = s_c + s_{m_n} + c_n - EU_E(\pi; 2, n) - w_c;$$

$$EU_E(\pi; 2, n) = a_n R \frac{p+S}{p+R}$$

In this equilibrium only unproductive agents will take the agency job; the productive ones will prefer to follow a private sector career. There is high politicization, which induces the manager to recommend only favorable policies. The probability of having a policy implemented is low ($(1-\lambda)a_n$*) but no unfavorable policy will ever be implemented.*

Proof. See Appendix A.III

In the separating equilibrium, the boss finds it optimal to focus the agency design on the unproductive manager. In that case the boss does not need to compete with the private sector for the productive agent. Therefore, she can lower management wages, saving on the labor costs, since the

unproductive manager has lower opportunity cost to staying in the agency. However, since the unproductive manager is less likely to find good policies than the productive one, the boss will find it optimal to monitor him more closely. This is why there is high politicization in this case. The wages will be such that:

$$w_c + w_m = s_c + s_{m_n} + c_n - a_n R\frac{p+S}{p+R} \text{ with } w_c \leq \frac{s_c + s_{m_n}}{2}$$

The expected second period career benefit for the manager is totally extracted by the boss, who reduces total wages accordingly. The manager is compensated for his expertise acquisition cost, and the net utility of the employee is his private sector career opportunity cost, $s_c + s_{m_n}$.

The boss' net utility is: $B_s = v - \left(s_c + s_{m_n} + c_n\right) + a_n Y_H + a_n R\frac{p+S}{p+R}$ but the boss only receives that return with probability $1-\lambda$, i.e., when the candidate is of the unproductive type. Therefore, her expected payoff is:

$$(1-\lambda)B_s = (1-\lambda)\left[v - \left(s_c + s_{m_n} + c_n\right) + a_n Y_H + a_n R\frac{p+S}{p+R}\right].$$

In this separating equilibrium, if there is a manager (which occurs with probability $1-\lambda$), then a policy will be implemented with probability a_n. Therefore, a policy will be implemented with probability $(1-\lambda)a_n$. Only favorable policies will be implemented; therefore, the probability of a favorable policy being implemented is $(1-\lambda)a_n$. Hence, the probability of an unfavorable policy being implemented is 0. Finally, the probability of no policy at all being implemented is $\lambda + (1-\lambda)(1-a_n)$, which will occur if the candidate employee is productive (in which case he chooses not to work in the agency) or if he is unproductive and cannot find a favorable policy to recommend.

In total, in a market where the proportion of productive employees is low, the boss will only select low-productivity employees, incentivize them to become managers but maintain high levels of

political control. This results in a low wage and low productivity bureaucracy (i.e., fewer recommended projects) that only implements projects that favor the boss.

Fully Pooling Equilibrium

In this case the agency is designed in such a way that both productive and unproductive employees enter and become managers. Therefore, the wage schedule will be chosen in such a way that the productive agent's individual rationality constraint is active, i.e., $w_m + w_c = s_c + s_{m_p} + c_p - EU_E(\pi; 2, p)$. Therefore, the boss' policy expected payoff in the second period is $EU_B(\pi; 2, \lambda)$. But then, the boss' utility becomes: $v - \left(s_c + s_{m_p} + c_p\right) + EU_E(\pi; 2, p) + EU_B(\pi; 2, \lambda)$. Therefore, the boss' problem reduces to:

$$\max_{\pi} \; EU_E(\pi; 2, p) + EU_B(\pi; 2, \lambda).$$

The solution to this problem must also consider the two possible politicization environments, the low-control and the high-control cases and is presented in Appendix A.IV. Proposition 4 presents the main equilibrium results.

Proposition 4. *Suppose the boss wants to design the agency to maximize her expected return under the restriction that both the productive and the unproductive agents enter, acquire expertise, and become managers. Then, the optimal design will be given by the triplet* (w_c, w_m, π) *where:*

$$\pi = \frac{R}{p + R}; \quad w_c \in [0, \overline{w_c}]; \quad w_m = s_c + s_{m_n} + c_n - EU_E(\pi; 2, n) - w_c;$$

$$\overline{w_c} = \frac{s_c + s_{m_n} - \left(c_n - c_p\right) - [EU_E(\pi; 2, p) - EU_E(\pi; 2, n)]}{2}$$

In this equilibrium the agent will take the public job regardless of his type. There is high politicization, which induces the manager to recommend only favorable policies. The probability of having a policy implemented is higher ($\lambda a_p +$

$(1-\lambda)a_n$*) than in the separating equilibrium and no unfavorable policy will ever be implemented. However, the career-long cost of the employee wages is higher than in the separating equilibrium.*

Proof. See Appendix A.IV.

In the fully-pooling equilibrium, wages are high enough to attract both types of employees who enter, acquire expertise, and stay as managers in the second period. There will be high intervention to induce managers to recommend only good policies. The wage budget will be higher since it must account for high outside wages and pay less productive types similarly to the more productive types.

The wages will be such that:

$$w_c + w_m = s_c + s_{m_p} + c_p - Ra_p\frac{p+S}{p+R} \quad \text{with} \quad w_c \leq \frac{s_c+s_{m_p}}{2}$$

The expected second period career benefit for the productive manager is $Ra_p\frac{p+S}{p+R}$ but it is totally extracted by the boss, who reduces the total wages accordingly. That manager is compensated for his expertise acquisition cost c_p. The expected second period career benefit for the unproductive manager is $Ra_n\frac{p+S}{p+R}$. That manager is completely compensated for his expertise acquisition cost c_n and, in addition, receives an extra wage benefit due to the fact that the other type is compensated for his outside career opportunities:

$$w_c + w_m = s_c + s_{m_p} + c_p - Ra_p\frac{p+S}{p+R} > s_c + s_{m_n} + c_n - Ra_n\frac{p+S}{p+R}.$$

Therefore, although the net benefit for the high-productivity employee remains his private sector opportunity cost $s_c + s_{m_p}$, the low-productivity manager obtains a higher net benefit.

The boss' net utility is: $B_{fp} = v - \left(s_c + s_{m_p} + c_p\right) + (\lambda a_p + (1-\lambda)a_n)Y_H + a_pR\frac{p+S}{p+R}$.

The boss receives that utility with probability 1. In this pooling equilibrium, only favorable policies will be proposed and implemented. Therefore, the probability of a policy being implemented is $\lambda a_p + (1-\lambda)a_n$, which is also the probability of any policy being implemented. The probability of an

unfavorable policy being implemented is 0. Finally, the probability of no policy at all being implemented is $1-\left(\lambda a_p+(1-\lambda)a_n\right)=\lambda\left(1-a_p\right)+(1-\lambda)(1-a_n)$.

It is important to note that this equilibrium yields more policy implementation than the separating equilibrium.

Semi-pooling Equilibrium

In this case, the agency is designed in such a way that both agents enter but only the productive employee becomes a manager. Therefore, the wage schedule will be chosen in such a way that the productive agent's individual rationality constraint is active, i.e., $w_m+w_c=s_c+s_{m_p}+c_p-EU_E(\pi;2,p)$. As such, the boss' problem reduces to:

$$\max_{\pi}\ EU_E(\pi;2,p)+EU_B(\pi;2,p).$$

The solution to this problem must also consider the two possible politicization environments, the low-control and the high-control cases and is presented in Appendix A.V. Proposition 5 presents the main equilibrium results.

Proposition 5. *Suppose the boss wants to design the agency to maximize her expected return under the restriction that both the productive and the unproductive agents enter, but only the productive agent acquires expertise and becomes a manager. Then, the optimal design will be given by the triplet* (w_c,w_m,π) *where:*

$$\pi=0;\quad w_c=\overline{w_c}=\frac{s_c+s_{m_p}-\left(c_n-c_p\right)}{2};$$

$$w_m=s_c+s_{m_p}+c_p-R-w_c=\frac{s_c+s_{m_p}}{2}+(c_n-R)$$

In this equilibrium there is low politicization, which induces the (productive) manager to recommend any policy he is able to produce. The probability of having a policy implemented (λ) *will generally be lower than in the fully-pooling*

equilibrium andt unfavorable policies will be implemented with positive probability ($\lambda(1-a_p)$). Furthermore, the career-long cost of the employee wages is higher than in the separating equilibrium.

Proof. See Appendix A.V.

In the semi-pooling equilibrium, management wages are too low for the low-productivity agent (who has high expertise acquisition costs) to be interested in becoming a manager. The high-productivity agent will enter, acquire expertise, and become a manager in the agency, knowing that the value they will get from managerial wages and recommending policies will compensate them for the cost of acquiring expertise. Since only high productivity employees become managers, a good policy will be more likely to be manager's recommendation. Therefore, the boss will find it more cost effective to reduce monitoring and management wages accordingly and take the risk of implementing a (less likely) bad policy. There will be low politicization in the agency since only productive types (with sufficiently high probabilities of finding a good project) have become managers. As a result, the overall wage budget ($w_c + w_m$) will be lower than with the fully-pooling equilibrium since the higher value the productive manager gets from not being audited (i.e., R vs. S) can be extracted by the boss.[5]

The wages will be such that: $\overline{w_c} + w_m = s_c + s_{m_p} + c_p - R$ with $\overline{w_c} = \frac{s_c+s_{m_p}}{2} - [(c_n - EU_E(\pi;2,n)) - (c_p - EU_E(\pi;2,p)] \in \left[\frac{s_c+s_{m_n}}{2}, \frac{s_c+s_{m_p}}{2}\right]$. The expected second period career benefit is the highest possible for the productive manager (R), but it is totally extracted by the boss, who reduces total wages accordingly. The productive manager is compensated for his expertise acquisition cost, and the net utility of the employee is his private sector career opportunity cost, $s_c + s_{m_p}$.

The boss' net utility is:

[5] Recall that $EU_E(\pi = 0;2,p) > EU_E\left(\pi = \frac{R}{p+R};2,p\right)$.

$$B_{sp} = \lambda\left[v - \left(s_c + s_{m_p} + c_p\right) + R + a_p(Y_H - Y_L) + Y_L\right] + (1-\lambda)[2v - 2\overline{w_c}].$$

In this semi-pooling equilibrium, if the employee is productive (which occurs with probability λ), then a policy will always be implemented. Therefore, a policy will be implemented with probability λ. Therefore, the probability of a favorable policy being implemented is λa_p. Furthermore, the probability of an unfavorable policy being implemented is $\lambda(1-a_p)$. Finally, the probability of no policy at all being implemented is $(1-\lambda)$, which will occur only if the candidate employee is of the unproductive type.

In this equilibrium, the boss can induce all types of employees to enter, promote only the most productive employees and give them discretion to do their work. The boss will accept all of the manager's recommendations, accepting the fact that this will hurt the boss on occasion. The expected productivity, i.e., the probability a policy in implemented, in this equilibrium is λ, since this is the probability a productive agent is hired and, in that case, he will become manager and propose whatever policy he is able to find. In comparison, the expected productivity in the fully pooling equilibrium is $\lambda a_p + (1-\lambda)a_n$. Note that the first summand in that later expression, λa_p is smaller that λ. However, there is a second summand, $(1-\lambda)a_n$, which could make that sum higher or lower than λ. If there is a high supply of productive employees (high λ), then the second summand may be negligeable and the semi-pooling equilibrium will be more productive. However, in general, we expect that the fully-pooling equilibrium will yield higher production of policies (i.e., a more productive agency).

Summary

Table 2 summarizes the findings regarding the three possible equilibria. Note that the semi-pooling equilibrium is the only equilibrium where some unfavorable policies are implemented. Furthermore, in general, the fully-pooling equilibrium yields more policy implementation than the

separating equilibrium ($\lambda > \lambda a_p + (1-\lambda)a_n$), but the boss has to pay higher wages to the employees.[6] It is noteworthy that the equilibrium that ensures the highest (ex-ante) number of favorable policy implementations (to the boss), the fully-pooling equilibrium, is the one that requires the highest agency wage budget.

Table 2. Summary of the characteristics of the three possible equilibria.

Equilibrium type	Separating	Fully-pooling	Semi-pooling
Manager's type	Unproductive	Both types	Productive
Control type	High	High	Low
Policy implementation probability	$(1-\lambda)a_n$	$\lambda a_p + (1-\lambda)a_n$	λ
Favorable policy implementation probability	$(1-\lambda)a_n$	$\lambda a_p + (1-\lambda)a_n$	λa_p
Unfavorable policy implementation probability	0	0	$\lambda(1-a_p)$
No policy implementation probability	$\lambda + (1-\lambda)(1-a_n) = 1-(1-\lambda)a_n$	$\lambda(1-a_p) + (1-\lambda)(1-a_n) = 1-[\lambda a_p + (1-\lambda)a_n]$	$1-\lambda$
Binding IR (individual rationality) constraint	Unproductive	Productive	Productive
Total manager's wage	Low	High	Medium

Optimal Politicization Level

The fact that there are three different equilibria, each with huge implications for government performance, raises the question of optimal design.[7] For the boss to choose to implement the

[6] As discusses earlier, the semi-pooling equilibrium will yield higher numbers of policy implementations than the other equilibria only if there are extremely high numbers of productive agents in society; however, even in that case, some of these policies will be unfavorable to the boss.

[7] Suppose that, due to budget or legal constraints, the agency cannot spend above a certain budget $\Sigma > 0$ in total wage payments. The total wage payments for each equilibrium when the employee is hired is $b_s = s_c + s_{m_n} + c_n - Ra_n\frac{p+S}{p+R}$ in the separating equilibrium, $b_{sp} = s_c + s_{m_p} + c_p - R$ in the semi-pooling equilibrium, and $b_{fp} = s_c + s_{m_p} + c_p - Ra_p\frac{p+S}{p+R}$ in the pooling equilibrium with $b_s < b_{sp} < b_{fp}$. Suppose, now, that if $\Sigma < b_p$ then the boss will not be able to implement the fully-pooling equilibrium, which is the safest equilibrium and the one that produces the higher number of

separating or one of the pooling equilibria, she must compare the payoffs B_{fp}, B_{sp} and $(1-\lambda)B_s$. The final agency design will depend on which of these expected payoffs is higher. For example, by comparing expressions B_{fp} and $(1-\lambda)B_s$, we can show that the fully-pooling equilibrium will be preferred to the separating equilibrium if the following condition is satisfied[8] :

$$\left(s_{m_p}+c_p\right)-(1-\lambda)\left(s_{m_n}+c_n\right)\leq \lambda a_p Y_H+\left[a_p-(1-\lambda)a_n\right]R\frac{p+S}{p+R}+\lambda(v-s_c).$$

The right hand side of the inequality reflects the additional benefit of the fully-pooling equilibrium, which are an increase in the number of favorable policies (the first summand), an increase in the manager's expected career benefits the boss can extract to herself (second summand) and an increase in the clerk's output (assuming $v > s_c$). The left hand side of the inequality reflects the additional costs of the fully-pooling equilibrium, which are higher management wages plus expertise acquisition cost compensations (recall that $s_{m_p}+c_p > s_{m_n}+c_n$).

The basic trade-off here is clear. On one hand, the separating equilibrium is cheaper to the boss in terms of wage payments, because the boss does not need to attract the productive manager who has a higher private management wage. On the other hand, by attracting both managers, the boss increases the number of favorable policy recommendations, increases the rents she can extract from expected career benefits of the manager and reduces the probability of agency shut-down (not being able to hire an employee) in the fully-pooling equilibrium. The optimal choice will depend on how frequent the productive employee is in society. If there are a large number of productive employees,

favorable projects. If Σ if further restricted so that $\Sigma < b_{sp}$, then the boss will not be able to implement the semi-pooling equilibrium either.

[8] Indeed, $B_{fp}\geq(1-\lambda)B_s \Leftrightarrow \lambda(v-s_c)-\left[\left(s_{m_p}+c_p\right)-(1-\lambda)\left(s_{m_n}+c_n\right)\right]+[\mu-(1-\lambda)a_n]Y_H+\left[a_p-(1-\lambda)a_n\right]R\frac{p+S}{p+R}\geq 0$. Now, $\mu-(1-\lambda)a_n=\lambda a_p$. Therefore, the fully-pooling equilibrium is preferred if: $\left[\left(s_{m_p}+c_p\right)-(1-\lambda)\left(s_{m_n}+c_n\right)-\lambda(v-s_c)\right]\leq \lambda a_p Y_H+\left[a_p-(1-\lambda)a_n\right]R\frac{p+S}{p+R}$.

it is worth attracting them although there will be higher wage payments. If they are not so frequent, the boss is better off keeping only the unproductive types, at a lower cost.

A full analysis including the three possible equilibrium types depends on the specific parameters of the problem and is left as an exercise to the reader.

Simulation

To illustrate the different possible equilibria, consider the three simple parametrizations of the model described in Table 3. The only difference between parametrizations (i) and (ii) is that the unproductive agent is slightly less productive in the parameterization (ii). The difference between parametrizations (ii) and (iii) is that the private sector wages are higher in the latter parameterization. Finally, the difference between (iii) and (iv) is that the unproductive agent is more productive in the latter.

Table 3. Sample Parametrizations of the Agency Design Game

	Y_H	Y_L	R	S	p	a_p	a_n	c_p	c_n	v	s_c	s_{m_n}	s_{m_p}
(i)	10	−10	4	2	1	0.8	0.4	1	2	2	0.5	1.5	3
(ii)	10	−10	4	2	1	0.8	0.3	1	2	2	0.5	1.5	3
(iii)	10	−10	4	2	1	0.8	0.3	1	2	2	1	3	6
(iv)	10	−10	4	2	1	0.8	0.4	1	2	2	1	3	6

Table 4 presents the boss' expected payoffs for each one of the possible agency designs for three possible values of the parameter λ: $\lambda = 0.1$ to express the situation where the productive employee is very infrequent, $\lambda = 0.3$ for the case where the productive employee is more frequent and $\lambda = 0.5$ for the environment where the productive employee is as frequent and the unproductive agent. For example, this might reflect states or countries with higher or lower levels of public education or differences across types of government work for which there is a large or small labor supply.

Table 4. Boss' Expected Payoff for Each Agency Design: Three Parametrizations

Agency design / λ	Separating equilibrium	Fully-pooling equilibrium	Semi-pooling equilibrium
	Parametrization (i): Average unproductive agent, low private sector competition		
0.1	2.66	3.82	3.00
0.3	2.07	4.62	4.00
0.5	1.48	5.42	5.00
	Parametrization (ii): Very unproductive agent, low private sector competition		
0.1	1.55	2.92	3.00
0.3	1.20	3.92	4.00
0.5	0.86	4.92	5.00
	Parametrization (iii): Very unproductive agent, high private sector competition		
0.1	-0.25	-0.58	-0.50
0.3	-0.20	0.42	0.50
0.5	-0.14	1.42	1.50
	Parametrization (iv): Average unproductive agent, high private sector competition		
0.1	0.86	0.32	-0.50
0.3	0.67	1.12	0.05
0.5	0.48	1.92	1.50

Note: The parametrizations' values are presented in Table 3. The parameter λ represents the percentage of productive agents in society.

These simple parameterizations suggest that the fully-pooling equilibrium is the best agency design available if the unproductive agent is not too unproductive and the private market does not value expertise too strongly. If the unproductive agent is highly unproductive and the private sector still does not value expertise too strongly, then the semi-pooling equilibrium dominates. The boss benefits from only promoting the most productive employees. The separating equilibrium is the best agency design only when the productive agent is very infrequent. Note that in that case where the productive agent is infrequent, if the private sector highly rewards productivity, then even the separating equilibrium yields negative expected payoffs to the boss. In this extreme case, the boss is better off shutting down the agency. Table 5 summarizes the simulations' findings.

Table 5. Optimal Design Given Private Sector Wages, Employee Productivity, and the Frequency of Productive Employees in Labor Market

Private sector productivity valuation	Unproductive agent's productivity	Frequency of the productive agent	Optimal agency design
Low	High	Any	Fully-pooling
Low	Low	Any	Semi-pooling
High	Low	Low	Separating
High	Low	High	Semi-pooling
High	High	Low	Separating
High	High	High	Fully-pooling

Implications for State Capacity

The question that motivates this paper is why democratic governments have such different administrative structures. Some governments have insular, professional, and productive bureaucracies that contribute effectively to economic growth and democratic governance. Other governments struggle with an overly politicized and unprofessional bureaucratic apparatus that leads them to be unproductive and often a drain on democratic governments. In this section, we try and draw out some of the key implications of the model for democracy and governance.

Human Capital and Public Agency Output. Consider a country with low human capital, either because of a lack of access to education or a workforce otherwise ill-suited to the complexities of modern governance. We expect that in that country the proportion of highly productive agents, λ, will be low. This is when the payoff $(1-\lambda)B_n$ of the separating equilibrium is the highest. Therefore, the separating equilibrium is more likely to be the preferred choice of the boss. This is indeed supported in the simulations. This is particularly the case considering that the wage cost of the agency is lowest in the separating equilibrium. Thus, if the low human capital country is also one with lower public sector budgets, we should expect that the separating equilibrium materialize. This implication is presented below:

> **Implication 1.** *In countries with low human capital and small budgets we expect that only low productivity agents will be hired by the public agency. In that case, the public agency will produce fewer projects but those produced will benefit the politician.*

Politicization, Agency Productivity, and Policy Quality. Consider now a country with high human capital. In that case, we expect that the proportion of productive agents, λ, is high enough, so that the separating equilibrium will be dominated. Therefore, the remaining choice of the boss is between a fully-pooling equilibrium with high politicization and a semi-pooling equilibrium with low politicization. In both cases, the boss compensates the agents according to the highest private sector career opportunity cost ($s_c + s_{m_p}$). But in the semi-pooling case, the (productive) manager has a higher expected career benefit. Therefore, the boss can extract that higher benefit and reduce management wages. Hence, the boss faces the following trade-off: paying a higher wage and ensuring more favorable projects approved (the fully-pooling equilibrium) or paying a lower wage and getting fewer favorable projects and some unfavorable projects. To summarize, lower wages require less control (politicization) and more risk (of having an unfavorable policy implemented), whereas more control (politicization) ensures less risk (of having an unfavorable policy) but requires higher wage payments.

> **Implication 2.** *In countries with high human capital the agency design will typically incentivize the productive agent to become a manager, which will result in higher numbers of favorable projects being implemented. Furthermore, the boss faces a trade-off between risk and cost, that is mediated by politicization. Indeed, the boss either:*
> *(i) chooses high politicization, incentivizes the unproductive and productive agent to become a manager, reduces the risk an unfavorable policy being implemented, increases the chances of favorable policies being proposed, but has to pay higher wages (the fully-pooling equilibrium) or,*
> *(ii) chooses low politicization, incentivizes the unproductive agent to remain a clerk and reduces wage payments, but increases the chances of an unfavorable policy being implemented and reduces the chances of a favorable policy being implemented (the semi-pooling equilibrium).*

Two unexpected consequences arise from the above trade-off. On one hand, the agency design that ensures the highest productivity and the lowest production of unfavorable policies is the one that induces both types of employees to become managers and maintains high control over their activity. In other words, the highest production of favorable policies arises when even the less productive employees become managers. On the other hand, if the boss wishes to make sure that only

the productive agent becomes a manager, then it is an optimal (cost-effective) strategy to reduce control (politicization). This, however, necessarily allows for the implementation of some unfavorable policies.

> **Implication 3.** *The agency design that ensures the highest number of favorable policies being implemented is the one that stimulates all types of employees, even the less productive ones, to become managers. Furthermore, the agency design that selects only the productive employees to become managers is also the agency where some unfavorable policies are implemented.*

Endogenous and Exogenous Wage Compression. Consider an agency designer who wishes to hire both types of agents but wishes to promote only the more productive agents. This will be the case if the semi-pooling equilibrium dominates the other two equilibria. In such a case, the clerk's wage has to be high enough to attract the unproductive agent (minimum wage) to the public sector but the manager's wage cannot be too high (maximum wage) or it will incentivize the less productive employee to become a manager. Therefore, the clerk's wage is higher than the private sector's clerk wage (s_c) and the manager's wage is lower than the private sector's manager wage. Furthermore, the total (life-long, i.e., clerk's plus manager's) wage in the public sector is lower than the total wage in the private sector. Therefore, wage compression, a stylized fact in the literature, may be the consequence of efforts to design a system where only the most productive employees are promoted, while keeping total wages low. This implication is summarized below.

> **Implication 4.** *Wage compression in the public sector may result from efforts to create incentives for productive employees to become managers and unproductive employees to remain as clerks. Under that design, initial (clerk's) wages in the public sector are higher than the corresponding wages in the private sector, whereas management wages are lower in the public than in the private sector.*

Suppose now that there is a legal constraint on the minimum (clerk's) wage a public agency can pay. If that minimum wage is higher than $\overline{w_c} = \frac{s_c + s_{m_p} - (c_n - c_p)}{2}$ then the boss will have to spend a higher budget if she wants to implement the fully-pooling equilibrium. In the presence of a budget constraint, the boss may find her hands tied and may have to settle with the semi-pooling when the fully-pooling equilibrium might have been her first choice. Moreover, if the minimum wage is above

$\frac{s_c+s_{m_p}}{2}$, a higher budget will also be needed to implement even the separating equilibrium. In that case, if the budget is constrained, the boss may have to implement a wage structure that induces both types of employees to enter the agency but not to acquire expertise and remain clerks. In other words, the requirement of a high clerk's minimum wage, combined with a rigid budget constraint might lead to a sub-optimal "agency of clerks" (Gailmard and Patty 2007).

Suppose now there is an upper bound on the possible manager wage. If that upper bound is lower than $\overline{w_m} = \frac{s_c+s_{m_p}}{2} + \frac{c_n+c_p}{2} - R$, then the boss is unable to implement the fully-pooling equilibrium. If, furthermore, that upper bound is lower than $\frac{s_c+s_{m_p}}{2} + c_p - R$ then the boss will not be able to implement the semi-pooling equilibrium either. Therefore, the maximum (manager's) wage requirement may eventually make the semi-pooling and the pooling equilibria unattainable, inducing, once again, a suboptimal "agency of clerks".

> **Implication 5.** *The exogenous imposition of a minimum (clerk's) wage or a maximum (manager's) wage may force the agency to design its incentives so that low and high productivity agents will be hired but no employee will acquire expertise. In this case, the public agency will produce no public policy and will be reduced to performing clerk's work.*

The possibility that externally imposed wage compression could lead to suboptimal outcomes is important, particularly if it prevent agencies from motiving employees to become experts and search for new projects and programs to innovate and solve problems on behalf of voters.

Conclusion

Among the most important choices elected officials can make in a democracy are those involving state capacity. Without a functioning bureaucracy, the choices of elected officials are largely symbolic (Huber and McCarty 2006). Yet, building a high capacity bureaucracy is fraught with difficulty. Elected officials must maintain control of government personnel to ensure that unelected

officials do not use their authority for their own benefit. Choices to recruit, develop, and retain personnel are constrained by limited budgets and a non-governmental labor market competing for the best talent.

In this paper we have presented a model of public sector bureaucracy to illuminate these challenges. The model highlights the trade-off between political intervention and productivity in the design of a public agency's wage and promotion schedule. It does so in cases where potential employees have different productivity levels and career options in the public and private sector. There are two types of administrative systems that emerge in equilibrium. In one, the government hires only low-productivity employees, incentivizes them to become managers and exerts high levels of political oversight. This results in a low productivity and low cost bureaucracy that only implements projects that favor the boss. In the other, the government will hire all types of employees. It may choose either an insular or politicized civil service, depending on features of the labor market. When the difference in productivity between employees in society is high, the optimal design leads to more insular systems that only promote the more productive employees to managers, while keeping the less productive employees in clerk positions. When the difference in productivity is low, the government selects a more politicized system but one that incentivizes both more and less productive employees to become managers.

Several interesting implications emerge from the analysis. First, wage compression may emerge endogenously as public officials try to design a system that promotes only the most productive managers. Agency officials that want to induce people to join the public sector must make entry wages high enough to encourage participation. To sort out the most productive, however, they need to keep managerial wages low enough so that the least productive will find staying a clerk more attractive. This is a different explanation for the widely observe patterns of wage compression across contexts. Indeed, there is a notably public sector pay gap, one that is particularly large in developing contexts and at

lower levels in the pay scale. In more developed contexts the pay gap is smaller or reverses for managerial positions. In our model, wage compression emerges to sort employees by quality rather than because of union pressure or as a way of deterring corruption (Johnson and Libecap 1994; Finan et al. 2017; Moe 2006). Managerial wages are too low to incentivize the least productive to become managers but high enough to attract the most productive. The latter are motivated by the fact that gaining expertise is cheaper for them and the fact that they will get larger policy benefits from recommending projects and having them approved.

Second, the model reveals an "optimality of inclusion", namely that the system that leads to the most productive agencies is, in general, one where both the least and most productive employees are incentivized to join the public sector and become managers. Such a choice, however, comes with a downside, namely a higher wage bill and higher levels of politicization. Managers have to be paid more in exchange for the loss of autonomy. In this model, we assume that politicization is costless but it is possible that politicization itself means higher wages for the labor and time necessary to review managerial recommendations. If this is the case, the number of cases where an inclusive system is optimal will decrease.

Finally, the model reveals a control versus expertise tradeoff noticed in other work (e.g., Bawn 1995; Gailmard and Patty 2007, 2013; Lewis 2008). In a system where only the most productive types are promoted, politicization levels are low. Political bosses accept all of the recommended projects, including some projects that are bad for the boss. As we suggested at the start, "good" or "bad" are in the eyes of the beholder and what is good for the boss may be bad for voters and vice versa. It is interesting to consider whether the "bad" projects proposed by productive managers and accepted by unsuspecting bosses are those that are good for the agency or public welfare in some larger sense. The projects work against the electoral interest of the boss but in the public interest. For instance, the ongoing reports released by government managers about the lack of fraud in the 2020 U.S. election

or alarming death rates are examples of projects beneficial for the manager but bad for the political boss. Are such reports only produced in places that are less politicized by design? Similarly, is one reason why the Centers for Disease Control went silent and was slow with reports during 2020 was due to the fact that the agency added political appointees that decreased the productivity of the agency (Bandler et al. 2020).

These are direct implications of the model but the model opens up other avenues for future research. We could start by making different assumptions about the labor market. For example, it is possible that the private sector may *particularly* value public sector expertise and this expertise may only be acquired by working in the public agency. For example, the knowledge of the agency contracting process may provide particular access to government contracts. A person working in the agency will have distinct knowledge that does not exist in the private market. In this case, the private sector wage, when the agent enters the public agency, acquires expertise, and leaves to the private sector, s_{pex} is higher than clerk's wage s_c, and may even be higher than private managers' wages s_{m_n} and s_{m_p}. If this is the case, entering the agency, acquiring expertise and leaving is not a dominated strategy anymore. There may be additional equilibria where employees of certain types, for example, the unproductive ones, would opt out of the public sector after acquiring public sector expertise.

We could also model different kinds of bureaucracies. Agencies vary in the extent to which clerk work is valued relative to managerial work. We have assumed that having an unproductive manager under high politicization yields higher payoffs than keeping the unproductive worker a clerk. The alternative assumption is that a clerk's output is high enough for the boss to prefer it to the lowest manager's return. In that case, there is a fourth type of equilibrium, in which the agency hires the employee but does not incentivize the employee to become a manager. In that case, the agency becomes an "agency of clerks", without policy output. It is possible that agencies engaged in different

kinds of activities – distribution, production, regulation, etc.—place different value on routine work versus innovation and problem solving (Wilson 1989).

Each of these potential extensions highlights the importance of understanding the administrative state in the context of modern politics and governance. Such efforts are fundamentally endeavors involving labor markets in the unique public sector context (Cameron et al. 2020).

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Appendix

A.I. Proof of Proposition 1. The second period subgame solution.

We look for pure-strategy Perfect Bayesian Equilibria (PBE).

Information set $\{t_{l8}, t_{l9}, t_{h8}, t_{h9}\}$:

Denote the Boss' beliefs by: $\mu_1 = \mu(t_{l8}), \mu_2 = \mu(t_{l9}), \mu_3 = \mu(t_{h8}), \mu_4 = \mu(t_{h9})$, with $\mu_1 + \mu_2 + \mu_3 + \mu_4 = 1$. Let $\mu = \mu_1 + \mu_3$, so that $\mu_3 + \mu_4 = 1 - \mu$.

Then, by Sequential Rationality, the boss chooses $d = 1$ if $\mu > -\frac{Y_L}{\Delta Y}$; $d = 0$ if $\mu < -\frac{Y_L}{\Delta Y}$; and is indifferent between implementing and not implementing the recommended policy if $\mu = -\frac{Y_L}{\Delta Y}$.

Consider the different possible choices for the boss.

Case 1. The boss chooses $d = 0$.

Then, it must be the case that $\mu \leq -\frac{Y_L}{\Delta Y}$. But then, in node t_{j4}, the employee chooses $r = 0$. Thus, Bayesian Consistency (BC) requires that $\mu = 1 > -\frac{Y_L}{\Delta Y}$, a contradiction. Therefore, there is no PBE in which the boss does not accept a manager's recommendation when auditing is unsuccessful in revealing the policy's true type.

Case 2. The boss chooses $d = 1$.

Then, it must be the case that $\mu \geq -\frac{Y_L}{\Delta Y}$.

In nodes $t_{j4}, j = p, n$, the manager recommends the (bad) policy if $\pi < \frac{R}{p+R}$; does not recommend the (bad) policy if $\pi > \frac{R}{p+R}$; and is indifferent between recommending or not the policy if $\pi = \frac{R}{p+R}$.

Note that the manager's decision does not depend on his type. Therefore, he will either always recommend a bad policy (if $\pi < \frac{R}{p+R}$) or never recommend it (if $\pi > \frac{R}{p+R}$) regardless of his type. This is a consequence of the fact that, after the (bad) policy has been revealed to the employee, all that matters to him is the probability that the boss will find out that the policy is bad, i.e., the politization level. The probability of finding a good policy is, by then, gone.

Therefore, we analyze two subcases.

Subcase 2.1. The employee of type $j = p, n$ recommends the (bad) policy.

Then, it must be the case that $\pi \leq \frac{R}{p+R}$. We call this the **low-politicization case**. But, in that case, BC requires that $\mu = \theta a_p + (1-\theta) a_n$. Since we must have $\mu \geq -\frac{Y_L}{\Delta Y}$, it must be the case that $\theta a_p + (1-\theta) a_n \geq -\frac{Y_L}{\Delta Y}$.

Therefore, if $\theta a_p + (1-\theta)a_n \geq -\frac{Y_L}{\Delta Y}$ there is a PBE equilibrium of the second period incomplete information subgame where the manager always recommends the policy, regardless of his type and regardless of it being bad or good, and the boss accepts the recommendation whenever the auditing does not reveal the true type of the policy.

In that case, the PBE in the second period game is:

$$\left(\left(r_{jY_H}=1, r_{jY_L}=1, j=l,h\right), \left(d_{Y_H}=1, d_N=1, d_{Y_L}=0\right), \mu=\theta a_p+(1-\theta)a_n \geq -\frac{Y_L}{\Delta Y}\right), \pi \leq \frac{R}{p+R}.$$

The corresponding expected payoff for the boss is $EU_B(\pi) = \left(\theta a_p + (1-\theta)a_n\right)Y_H - (1-\pi)(-Y_L)\left(1-\left(\theta a_p+(1-\theta)a_n\right)\right) + v - w_c - w_m$.

And for the employee of type j: $EU_E(\pi) = -\pi\left[(p+R) - a_j(p+S)\right] + R + w_c - c_j + w_m$.

Note that if $\mu < -\frac{Y_L}{\Delta Y}$ then there is no low-control equilibrium. This is a consequence of the fact that the employee's productivity is too low, so that too many bad policies would be proposed by the manager and implemented by the boss. Since $\mu = \theta a_p + (1-\theta)a_n$, then there will be no low-control equilibrium if $a_n < -\frac{Y_L}{\Delta Y}$ and λ is sufficiently small, i.e., the unproductive employee is inefficient enough and there are few productive candidates. In particular, there is no low-control equilibrium if the boss is certain that second-period manager is unproductive ($\theta = 0$).

This is item (i) in Proposition 1.

<u>Subcase 2.2. The employee of type $j = p, n$ does not recommend the (bad) policy.</u>

Then, it must be the case that $\pi \geq \frac{R}{p+R}$. We call this the **high-politicization case**. But, in that case, BC requires that[9] $\mu = 1 > -\frac{Y_L}{\Delta Y}$.

In that case, the PBE in the second period game is:

$$\left(\left(r_{jY_H}=1, r_{jY_L}=0, j=l,h\right), \left(d_{Y_H}=1, d_n=1, d_{Y_L}=0\right), \mu=1\right), \qquad \pi \geq \frac{R}{p+R}$$

The corresponding expected payoff for the boss is $EU_B(\pi) = \left(\theta a_p + (1-\theta)a_n\right)Y_H + v - w_c - w_m$.

And for the employee of type j: $EU_E(\pi, j) = -\pi a_j(R-S) + a_j R + w_c - c_j + w_m$.

Note that the expected utility of the unproductive employee is potentially lower than that of the productive one both because of the lower probability of success and of the higher cost of acquiring expertise.

This is item (ii) in Proposition 1.

[9] And also $\mu_1 = \frac{\theta a_p}{\theta a_p + (1-\theta)a_n}, \mu_3 = \frac{(1-\theta)a_n}{\theta a_p + (1-\theta)a_n}, \mu_2 = \mu_4 = 0$

To summarize, in the second period the boss always implements the policy that is recommended by the manager when she is unable to verify its payoff. However, there are two possible situations regarding the behavior of the employee and the boss' intervention. In one of the two possible equilibria the boss invests little in auditing and the employee does recommend some bad policies. In the second situation, the boss invests enough in auditing and the employee only recommends good policies. Therefore, in equilibrium the boss always rewards the employees' expertise whenever the auditing mechanism does not reveal the true return of the policy.

A.II. Solution to the Principal's maximization problem when the boss wishes to induce the agent to take the public job, acquire expertise and stay in the agency as a manager.

To better understand the several possible choices of the potential employee, let us calculate his different possible payoffs:

NE: Not to enter the Agency: $s_c + s_{m_j}$

ENEL: Enter Agency, do not acquire expertise and leave: $w_c + s_c$

ENES: Enter Agency, do not acquire expertise and stay as a clerk: $w_c + w_c$

EEL: Enter Agency, acquire expertise and leave: $w_c - c_j + s_c$

EES: Enter Agency, acquire expertise & stay as a manager: $w_c - c_j + w_m + EU_E(\pi; 2, j)$

We expect that $w_c \leq s_{m_j}$ for $j = p, n$. This expectation is grounded in two real-world considerations. The first one is that clerk work, be it in the private or in the public sector, is a much simpler task than management work. Therefore, even if public sector wages are inflated, we would expect that they will not inflate to the point where the public sector's clerk wage is higher than the private sector's management wage. The second consideration is that, if this were the case, there would be no private sector, since any agent would be better off being a clerk in the Agency than following the private sector career.

In what follows, we suppose that this is the case in equilibrium, and we check that the solution we find does satisfy this property.

Under this assumption, NE≻ENEL. Therefore, ENEL will never be chosen in equilibrium.

Let us compare de other options two by two.

$$NE \succ ENES \Leftrightarrow s_c + s_{m_j} > 2w_c \Leftrightarrow w_c < \frac{s_c + s_{m_j}}{2}$$

Therefore, entering and staying as a clerk will only be better than not entering if the Agency's clerk wage is at least the average career-long wage in the private sector.

$$NE \succ EEL \quad \Leftrightarrow s_c + s_{m_j} > w_c - c_j + s_c \Leftrightarrow w_c < s_{m_j} + c_j$$

Note that by the initial assumption, this will always be the case.

$NE \succ EES \quad \Leftrightarrow s_c + s_{m_j} > w_c - c_j + w_m + EU_E(\pi; 2, j) \Leftrightarrow w_c + w_m < s_c + s_{m_j} + c_j - EU_E(\pi; 2, j)$

$ENES \succ EEL \Leftrightarrow 2w_c > w_c - c_j + s_c + \delta s_e \Leftrightarrow w_c > -c_j + s_c \Leftrightarrow w_c + c_j > s_c$

$ENES \succ EES \Leftrightarrow 2w_c > w_c - c_j + w_m + EU_E(\pi, 2j) \Leftrightarrow w_m - w_c < c_j - EU_E(\pi; 2, j)$

$EEL \succ EES \quad \Leftrightarrow w_c - c_j + s_c > w_c - c_j + w_m + EU_E(\pi; 2, j) \Leftrightarrow w_m < s_c - EU_E(\pi; 2, j)$

Now, to induce the agent to acquire expertise and stay, the following conditions must be met:

Participation Constraint:

$$IR_j\ (EES \succcurlyeq NE):\ EU_E(\pi) \geq s_c + s_{m_j}$$

Incentive Compatibility Constraints:

$$IC_{jel}\ (EES \succcurlyeq EEL):\quad EU_E(\pi) \geq w_c - c_j + s_c$$

[E prefers to acquire expertise and stay than to acquire expertise and leave]

$$IC_{jnl}\ (EES \succcurlyeq ENEL):\ EU_E(\pi) \geq w_c + s_c$$

[E prefers to acquire expertise and stay than not to acquire expertise and leave]

$$IC_{jns}\ (EES \succcurlyeq ENES):\ EU_E(\pi) \geq w_c + w_c$$

[E prefers to acquire expertise and stay than not to acquire expertise and stay as a clerk]

Therefore, the boss's problem is:

$$\max_{w_c, w_m, \pi}\ v - w_c - w_m + EU_B(\pi; 2, j)$$

subject to:

$$IR_j:\quad w_c - c_j + w_m + EU_E(\pi; 2, j) \geq s_c + s_{m_j}$$

$$IC_{jel}:\ w_c - c_j + w_m + EU_E(\pi; 2, j) \geq w_c - c_j + s_c$$

$$IC_{jnl}:\ w_c - c_j + w_m + EU_E(\pi; 2, j) \geq w_c + s_c$$

$$IC_{jns}:\ w_c - c_j + w_m + EU_E(\pi; 2, j) \geq w_c + w_c$$

Note that, $c_j > 0$, $IC_{jnl} \Rightarrow IC_{jel}$. Therefore, IC_{jel} can be eliminated. Furthermore, we expect that in equilibrium, $w_c \leq s_{m_j}$. If that is the case, then $IR_j \Rightarrow IC_{jnl}$. Therefore, IC_{jnl} can also be eliminated. Hence, the Boss' problem can be written as:

$$\max_{w_c, w_m, \pi}\ v - w_c - w_m + EU_B(\pi; 2, j)$$

subject to:

$$IR_j: \quad w_c - c_j + w_m + EU_E(\pi; 2, j) \geq s_c + s_{m_j}$$

$$IC_{jns}: \ w_c - c_j + w_m + EU_E(\pi; 2, j) \geq w_c + w_c$$

Or equivalently:

$$\max_{w_c, w_m, \pi} v - w_c - w_m + EU_B(\pi; 2, j)$$

subject to:

$$IR_j: \quad w_m + w_c \geq s_c + s_{m_j} + c_j - EU_E(\pi; 2, j)$$

$$IC_{jns}: \ w_m - w_c \geq c_j - EU_E(\pi; 2, j)$$

Now, for every choice of π, the Boss wants to minimize the total wage cost $w_m + w_c$, therefore, she will choose a solution in which the condition IR_j is active, if that is feasible. Try,

$$w_m + w_c = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j)$$

$$w_m = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j) - w_c$$

Plugging in into IC_{jns} yields:

$$s_c + s_{m_j} + c_j - EU_E(\pi, 2j) - 2w_c \geq c_j - EU_E(\pi; 2, j)$$

$$w_c \leq \frac{s_c + s_{m_j}}{2}$$

$$w_m \geq \frac{s_c + s_{m_j}}{2} + c_j - EU_E(\pi; 2, j)$$

There are several solutions to the choices of w_c and w_m that satisfy the conditions:

$$w_m + w_c = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j)$$

$$w_c \leq \frac{s_c + s_{m_j}}{2}$$

$$w_m \geq \frac{s_c + s_{m_j}}{2} + c_j - EU_E(\pi; 2, j)$$

Note that the solution satisfies the initial expectation:

$$w_c \leq \frac{s_c + s_{m_j}}{2} < s_{m_j}$$

Therefore, any choice (w_c, w_m) where:

$$w_c \in \left[0, \frac{s_c + s_{m_j}}{2}\right]$$

$$w_m = s_c + s_{m_j} + c_j - EU_E(\pi; 2, j) - w_c$$

is an optimal choice for the wage schedule of the agency.

The limiting cases are:

Lowest possible entry-level salary, highest possible management salary:

$$(w_c, w_m) = \left(0, s_c + s_{m_j} + c_j - EU_E(\pi; 2, j)\right)$$

Highest possible entry-level salary, lowest possible management salary:

$$(w_c, w_m) = \left(\frac{s_c + s_{m_j}}{2}, \frac{s_c + s_{m_j}}{2} + c_j - EU_E(\pi; 2, j)\right)$$

Note that the second period wage will either:

compensate the manager for his net loss in joining the agency (and becoming a manager and dedicating to his task), if $EU_E(\pi; 2, j) < c_j$;

or be reduced by the manager's net gain in joining the agency if $EU_E(\pi; 2, j) > c_j$.

Finally, note that the lower the second period career benefit for the manager, the higher wages need to be to attract the manager. Therefore, if there is an upper bound on the management wage this may force the boss to either increase the clerk's wage or to increase the second period benefits for the manager, which means reducing control.

Now, once the wage schedule has been decided optimally, the Boss' problem can be rewritten as:

$$\max_{\pi} \quad v - \left(s_c + s_{m_j} + c_j\right) + EU_E(\pi; 2, j) + EU_B(\pi; 2, j)$$

The figure below gives an interpretation of each one of the components of the reduced objective function.

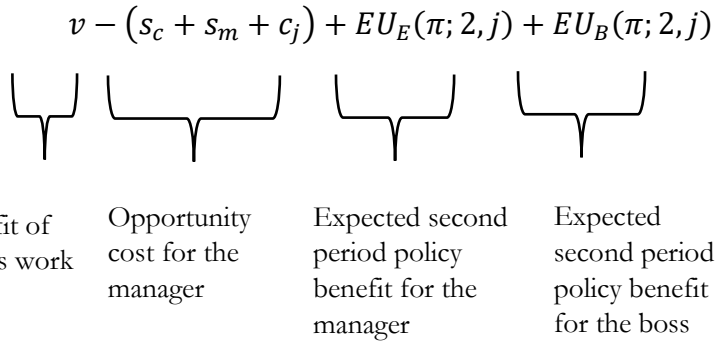

Figure A.II.1- The different components of the boss' objective function.

The boss' problem is equivalent to:

$$\max_{\pi} EU_E(\pi; 2, j) + EU_B(\pi; 2, j)$$

The solution to this problem will depend on the specific PBE we are focusing on. We will make that analysis later.

Note that, since IR_j is binding, $w_m + w_c - c_j + EU_E(\pi; 2, j) = s_c + s_{m_j}$.

Therefore, the Boss is able to extract all the benefits from the relationship with the employee, who's net utility remains his outside opportunity, $s_c + s_{m_j}$. This is so because in this first model there is perfect information on the manager's type.

In particular, if the career benefits are high compared to the expertise acquisition level, i.e., if $EU_E(\pi; 2, j) > c_j$, then **the agency's total wage is lower than the private sector's wage, overall**.

However, despite that, there are several equilibria where the agency's clerk wage is above the private sector's one. These corresponds to the solutions:

$$w_c \in \left[s_c, \frac{s_c + s_{m_j}}{2}\right]$$

Conversely, if $EU_E(\pi, 2) < c_j$, then the Agency's total wage will be higher than the private sector's wage.

A.III. The optimal politicization level for the separating equilibrium

In this case the wage schedule will be chosen in such a way that the unproductive agent's individual rationality constraint is active, i.e., $w_m + w_c = s_c + s_{m_n} + c_n - EU_E(\pi; 2, n)$.

But then, the boss' problem reduces to:

$$\max_{\pi} \quad v - \left(s_c + s_{m_n} + c_n\right) + EU_E(\pi; 2, n) + EU_B(\pi; 2, n)$$

And this problem is equivalent to:

$$\max_{\pi} \; EU_E(\pi; 2, n) + EU_B(\pi; 2, n)$$

Let us analyze the two possible second period politicization environments.

The low-control environment: $\pi \leq \frac{R}{p+R}$

In this equilibrium we have:

$$EU_B(\pi; 2, n) = a_n Y_H - (1 - \pi)(-Y_L)(1 - a_n)$$

$$EU_E(\pi; 2, n) = -\pi[(p + R) - a_n(p + S)] + R$$

Therefore,

$$EU_E(\pi; 2, n) + EU_B(\pi; 2, n) = [R + a_n(Y_H - Y_L) + Y_L] - \pi[p + R + Y_L - a_n(p + S + Y_L)]$$

Now, by assumption (iii), the above expression is increasing in π. Therefore, the optimal choice of politicization in this case is $\pi_{lc} = \frac{R}{p+R}$.

The rationale for this result is that the reduction in the probability of finding a good policy, due to the fact that the low productivity agent is the one who is looking for the policy, makes the boss prefer to have the highest possible control.

Note, however, that this cannot be an equilibrium of the game, since, in this case, the boss prefers to increase slightly the level of politicization and ensure that the manager has no incentive to recommend a bad policy ($\pi = \frac{R}{p+R} + \varepsilon$ with $\varepsilon > 0$ very small). Hence, we are left only with the high-control case.

Therefore, the only separating equilibrium in which (only) the unproductive agent becomes a manager is of the high control environment.

The high-control environment: $\pi \geq \frac{R}{p+R}$

In this equilibrium we have:

$$EU_B(\pi; 2, n) = a_n Y_H$$

$$EU_E(\pi; 2, n) = a_n R - a_n \pi (R - S)$$

Therefore,

$$EU_E(\pi; 2, n) + EU_B(\pi; 2, n) = a_n(Y_H + R) - \pi a_n (R - S)$$

The above expression is a decreasing function of π. Therefore, the boss wants to choose the lowest possible politicization level that still induces the agent not to recommend bad policies. Therefore, the optimal choice for the boss in this case is $\pi_{hc} = \frac{R}{p+R}$.

The main rationale here is that, on one hand, the boss wants politicization to be high enough to prevent the agent to recommend a bad policy. Then, in equilibrium, only good policies are recommended. However, every time the auditing is able to assess the true value of the policy, the manager loses potential career benefits (by the amount of $R - S$). Therefore, the higher π, the higher has to be the employee's wage and, therefore, the boss' payoff.

In this equilibrium, $EU_E(\pi; 2, n) = a_n R - a_n \frac{R}{p+R}(R - S) = a_n R \left(1 - \frac{R-S}{p+R}\right) = a_n R \frac{p+S}{p+R}$

The boss' policy payoff is:

$$EU_E(\pi; 2, n) + EU_B(\pi; 2, n) = a_n Y_H + a_n R \frac{p + S}{p + R}$$

In summary, when the boss designs the agency in such a way that only the less productive agent is interested in entering the public sector, he will reduce intervention to the minimum necessary to prevent the agent from recommending bad policies, in order the reduce wage costs.

A.IV. The optimal politicization level for the fully-pooling equilibrium

In this case the agency is designed in such a way that both agents enter and become managers. Therefore, the wage schedule will be chosen in such a way that the productive agent's individual rationality constraint is active, i.e.,

$$w_m + w_c = s_c + s_{m_p} + c_p - EU_E(\pi; 2, p)$$

In this equilibrium agents of both types enter and become managers. Therefore, the boss policy expected payoff in the second period is $EU_B(\pi; 2, \lambda)$.

But then, the boss' utility becomes: $v - \left(s_c + s_{m_p} + c_p\right) + EU_E(\pi; 2, p) + EU_B(\pi; 2, \lambda)$

Therefore, the boss' problem reduces to:

$$\max_{\pi} \; EU_E(\pi; 2, p) + EU_B(\pi; 2, \lambda)$$

Let us analyze the two possible second period equilibrium types.

The low-control environment: $\pi \leq \frac{R}{p+R}$

In this equilibrium[10] the second period equilibrium payoffs are presented below where $\mu = \lambda a_p + (1-\lambda)a_n$:

$$EU_B(\pi; 2, \lambda) = \mu Y_H - (1-\pi)(-Y_L)(1-\mu)$$

$$EU_E(\pi; 2, p) = -\pi\big[(p+R) - a_p(p+S)\big] + R$$

Therefore,

$$EU_E(\pi; 2, p) + EU_B(\pi; 2, \lambda) = [R + \mu(Y_H - Y_L) + Y_L] - \pi\big[p + R - a_p(p+S) - (-Y_L)(1-\mu)\big]$$

Now, since $a_p > a_n$, condition (iv) ensures that $p + R - a_p(p+S) - (-Y_L)(1-\mu) < 0$. Therefore, the expected payoff is increasing in politicization π. Hence, in this case, $\pi_{lc} = \frac{R}{p+R}$.

The rationale for this result is that the reduction in the probability of finding a good policy, due to the fact that the low productivity agent is the one who is looking for the policy with probability $1-\lambda$, makes the boss prefer to have the highest possible control.

Note, however, that this cannot be an equilibrium of the game since, in this case, the boss prefers to increase slightly the level of politicization and ensure that the manager has no incentive to recommend

[10] Recall that a low control equilibrium only exists if $\lambda a_l + (1-\lambda)a_h \geq -\frac{Y_L}{\Delta Y}$, i.e., the productive agent is frequent enough.

a bad policy ($\pi = \frac{R}{p+R} + \varepsilon$ with $\varepsilon > 0$ very small). Hence, we are left only with the high-control environment.

The high-control environment: $\pi \geq \frac{R}{p+R}$

In this equilibrium we have:

$$EU_B(\pi; 2, \lambda) = \mu Y_H$$

$$EU_E(\pi; 2, p) = a_p R - a_p \pi (R - S)$$

Therefore,

$$EU_E(\pi; 2) + EU_B(\pi; 2, p) = \mu Y_H + a_p R - \pi a_p (R - S)$$

The above expression is a decreasing function of π. Therefore, the boss wants to choose the lowest possible politicization level that still induces the agent not to recommend bad policies. Therefore, the optimal choice for the boss in this case is $\pi_{hc} = \frac{R}{p+R}$. And this is the only equilibrium of the fully-pooling type.

In this equilibrium,

$$EU_E(\pi; 2) + EU_B(\pi; 2, p) = \mu Y_H + a_p R - a_p \frac{R}{p+R}(R - S)$$

A.V. The optimal politicization level for the semi-pooling equilibrium

In this equilibrium agents of both types enter the agency but only the productive agent becomes a manager. Therefore, the boss policy expected payoff in the second period is $EU_B(\pi; 2, p)$.

But then, the boss' utility becomes:

$$\lambda \left[v - \left(s_c + s_{m_p} + c_p \right) + EU_E(\pi; 2, p) + EU_B(\pi; 2, p) \right] + (1 - \lambda) 2 (v - \overline{w_c})$$

Where $\overline{w_c} = \frac{s_c + s_{m_p}}{2} - \left[\left(c_n - EU_E(\pi; 2, n) \right) - \left(c_p - EU_E(\pi; 2, p) \right) \right] \in \left[\frac{s_c + s_{m_n}}{2}, \frac{s_c + s_{m_p}}{2} \right]$.

Since only the first summand depends on the politicization level, the boss' problem reduces to:

$$\max_{\pi} \; EU_E(\pi; 2, p) + EU_B(\pi; 2, p)$$

Let us analyze the two possible second period equilibrium types.

The low-control environment: $\pi \leq \frac{R}{p+R}$

In this equilibrium[11] the second period equilibrium payoffs are presented below where $\mu = \lambda a_p + (1-\lambda)a_n$:

$$EU_B(\pi; 2, p) = a_p Y_H - (1-\pi)(-Y_L)\big(1-a_p\big)$$

$$EU_E(\pi; 2, p) = -\pi\big[(p+R) - a_p(p+S)\big] + R$$

Therefore,

$$EU_E(\pi; 2, p) + EU_B(\pi; 2, p) = \big[R + a_p(Y_H - Y_L) + Y_L\big] - \pi\big[p + R + Y_L - a_p(p + S + Y_L)\big]$$

Now, by assumption (iii), the above expression is decreasing in π. Therefore, the optimal choice of politicization in this case is $\pi_{lc} = 0$.

The main rationale here is that the agent is so productive, that the likelihood of passing a bad policy is low enough so that the boss is better off incurring that expected cost without auditing and compensating the corresponding additional expected career benefit of the agent by reducing the agent's wage.

In this equilibrium,

$$EU_E(\pi; 2, p) + EU_B(\pi; 2, p) = R + a_p Y_H + \big(1-a_p\big)Y_L$$

The high-control environment: $\pi \geq \frac{R}{p+R}$

In this equilibrium we have:

$$EU_B(\pi; 2, p) = a_p Y_H$$

$$EU_E(\pi; 2, p) = a_p R - a_p \pi (R - S)$$

Therefore,

$$EU_E(\pi; 2, p) + EU_B(\pi; 2, p) = \mu Y_H + a_p R - \pi a_p (R - S)$$

The above expression is a decreasing function of π. Therefore, the boss wants to choose the lowest possible politicization level that still induces the agent not to recommend bad policies. Therefore, the optimal choice for the boss in this case is $\pi_{hc} = \frac{R}{p+R}$.

The main rationale here is that, on one hand, the boss wants politicization to be high enough to prevent the agent from recommending a bad policy. Then, in equilibrium, only good policies are recommended. However, every time the auditing is able to assess the true value of the policy, the

[11] Recall that a low control equilibrium only exists if $\lambda a_l + (1-\lambda)a_h \geq -\frac{Y_L}{\Delta Y}$, i.e., the productive agent is frequent enough.

manager loses potential career benefits (by the amount of $R - S$). Therefore, the higher π, the higher has to be the employee's wage and, therefore, the boss' payoff.

In this equilibrium, the boss' payoff is:

$$EU_E(\pi; 2, p) + EU_B(\pi; 2, p) = a_p(R + Y_H) - a_p \frac{R}{p + R}(R - S)$$

Comparison:

Comparing the two payoffs, it follows from assumption (iii) that:

$$EU_B(\pi_{lc}; 2, p) > EU_B(\pi_{hc}; 2, p)$$

The rationale is, again, that the productive agent finds a good policy with high probability, and that agent cares about his career enough, so that the boss can significantly reduce his wage in the low-control equilibrium.

In summary, when the boss designs the agency in such a way that only the more productive agent is interested in becoming a manager, he will reduce intervention to the minimum in order the reduce wage costs, just as he will do in the separating equilibrium.