Veto-Based Delegation*

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Abstract

This paper argues that in a principal-agent model with hidden information and no monetary transfers, the principal can achieve any incentive-compatible outcome with very little commitment. In fact, the main functions of commitment in this environment are (1) to allow the principal to design the default outcome and (2) to ensure that the principal has almost no formal control over the agent’s decisions. I establish the Veto-Power Principle: any incentive-compatible outcome can be implemented through veto-based delegation.

JEL Codes: D78, D82, L22, M54.

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1. Introduction

Consider a supervisor (the principal, she) and an employee (the agent, he) who have to decide on the amount of investment in research and development of a new product. The agent has more information about specific market opportunities, possible new technologies, and consumer preferences, but has a bias towards excessive investment since it allows him to build more human capital and develop business connections.

It is often argued that (1) in order for the principal to benefit from the agent’s knowledge, the latter should be delegated formal rights to initiate and implement decisions, while (2) in order to prevent the agent from behaving opportunistically, his decisions must be subject to at least minimal control. This is the argument behind

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the popular concept of separation of decision initiation and decision control by Fama and Jensen [8]. However, neither the circumstances in which this concept is applicable nor the optimal way of separating authority are well understood. The purpose of this paper is to shed some light on these issues.

If an arbitrary contract could be written, executed, and enforced at no cost, the concept of employee empowerment and control would be redundant: the Revelation Principle implies that any feasible outcome can also be achieved without granting the agent any formal rights. Yet, real organizations are characterized by multiple imperfections. In this paper, I study the environment with an informed agent, no monetary transfers and imperfect commitment, and identify the conditions under which the principal can achieve any incentive-compatible outcome by properly distributing authority between the agent and herself. The optimal decision-making arrangement is veto-based delegation: the agent is given the right to propose a decision, while the principal keeps the right to veto it. My main result is the Veto-Power Principle: any incentive-compatible outcome can be implemented through veto-based delegation.

This result is a generalization of a simple observation. Consider a cheap-talk game (Crawford and Sobel [6]). In this game, any equilibrium has a partition structure and each element of this partition leads to a distinct choice. On the equilibrium path, the sender (the agent) chooses from among these different alternatives by sending a corresponding message; if the sender uses an out-of-equilibrium message, the receiver (the principal) takes a certain decision, say $a$, regardless of what the sender’s private information might have been. One can rewrite this equilibrium as an outcome of veto-based delegation as follows: The agent proposes a decision. If this decision could have been induced through some message in the original game, the principal approves it. Otherwise, she vetoes it using action $a$.

Extending this argument to arbitrary incentive-compatible outcomes is essentially equivalent to characterizing the conditions under which there exists an appropriate default decision. This can be done if and only if the preferences satisfy a regularity condition. The potential difficulty is that either the default decision will not pose a sufficient threat for the agent or that for some proposals the principal will find the default decision more attractive and will therefore veto the decisions that should have been approved.

This is especially so for efficient (incentive-compatible) outcomes, where the agent often gets his most preferred choice and the incentives for the principal to intervene are strong. In order to implement such outcomes the literature assumes full commitment power on the part of the principal, which allows her to approve proposals within a prespecified set (and prohibit choices outside of this set) regardless of whether it is ex-post optimal. This paper argues that this assumption is unnecessary and demonstrates the exact nature of the required commitment powers: the principal should be able to (1) choose a default decision and (2) commit not to revise the proposals of the agent.

In fact, in our setting any other structure of authority would lead to efficiency losses. In many settings the efficient mechanism takes the following form: the agent
freely chooses from a *convex* set of alternatives. Under veto-based delegation the principal implements this outcome by using the most extreme allowed decision as the default: every allowed proposal is approved while everything else is vetoed. No other decision-making arrangement with imperfect commitment can replicate this outcome. If the principal had no control, the agent would make some choices outside of the allowed set. If she had more control, i.e., more than one default option, she would be tempted to exercise her veto power after some allowed proposals to correct for the conflict in preferences. Hence, the essential function of commitment in this environment is to ensure that the principal has almost no formal control over the final decisions. (The finding that restricting ex-post control is optimal is similar to the result in Dessein [7] that full delegation is often superior to communication; however, this paper shows that *some* ex-post control is still desirable.)

In the games of veto-based delegation, the freedom in constructing beliefs off the equilibrium path typically creates multiplicity of equilibria. I, therefore, repeat analysis under the requirement that the principal believes that an out-of-equilibrium proposal cannot come from the agent who would be hurt by its approval. Under this refinement, the efficient incentive-compatible outcomes can be implemented through veto-based delegation as a unique equilibrium. However, there are other (inefficient) outcomes that are impossible to implement under this more demanding solution concept.

The remainder of the paper is organized as follows: Section 2 discusses the related literature. Section 3 presents an example. Section 4 introduces the model. Sections 5 and 6 derive the Veto-Power Principle. Section 7 characterizes the efficient incentive-compatible outcomes and shows that veto-based delegation is the only decision-making arrangement that can implement them when the principal does not have full commitment power. Section 8 introduces a restriction on the out-of-equilibrium beliefs and discusses how it affects the results. In Section 9, I compare my results with the analysis of veto-based delegation and full delegation in Dessein [7]. Section 10 concludes.

2. Related Literature and Applications

Multiple reasons may limit the principal’s ability to commit to an arbitrary mechanism and administer monetary transfers: legal restrictions, non-verifiability of certain aspects of the environment, costs of enforcing a mechanism, and others. In a seminal article Crawford and Sobel [6] study the case where the principal has absolutely no commitment power: communication. They demonstrate that communication leads only to partial information transmission, where the agent partitions the space of signals and reports to the principal the element of this partition to which the observed signal actually belongs.

Gilligan and Krehbiel [9] and Krishna and Morgan [13] analyze the environment where the legislature (the principal) can choose from a limited set of legislative rules. They show that the homogenous committee (the agent) transfers to the legislature
more information under veto-based delegation than under communication. In their analysis the default decision is exogenously fixed. The Veto-Power Principle, then, complements their findings by stating that when the default decision can be chosen, veto-based delegation is not only preferable to communication but also to any other mechanism.

Melumad and Shibano [16] apply a similar model in analyzing the performance of the arrangements between the Securities and Exchange Commission (the principal) and the Financial Accounting Standards Board (the agent). They show that a subset of optimal incentive-compatible outcomes can be implemented under a form of veto-based delegation. The Veto-Power Principle generalizes their result to other specifications of payoffs and distributions of private information, and to all mechanisms rather than a subset of optimal mechanisms.

Dessein [7] considers an organizational setting where the principal (the supervisor) has limited commitment power and, in particular, cannot use monetary payments to motivate the agent (the employee). He shows that full delegation is often superior to communication. He also compares the relative performance of veto-based delegation and full delegation when the default decision implemented after the veto is exogenously fixed and finds that full delegation may be superior to veto-based delegation. This paper implies that when the default decision can be determined by the supervisor, veto-based delegation is better than both full delegation and communication.

Under assumptions of full commitment but no monetary transfers, Holmström [10], [11] and Melumad and Shibano [16] characterize the mechanisms that yield the highest payoff to the principal. They consider the case in which private information is uniformly distributed and payoffs are quadratic. Proposition 1 characterizes the efficient mechanisms in my model, providing a partial generalization of the existing results.\footnote{The optimal mechanism for cases in which monetary transfers are allowed is derived in Baron [3]. Also, Ottaviani and de Garidel-Thoron [17] analyze different mechanisms (including mechanisms involving monetary transfers) in a model where the principal has an uncertain degree of strategic sophistication.}

Several authors consider settings without monetary transfers in which the information structure is more complex. Aghion and Tirole [1] and Szalay [19] look at the case in which the agent is hired to learn decision-relevant information. Armstrong [2] investigates the structure of optimal mechanisms in situations whereby the preferences of the agent are uncertain. In contrast to their setting, I assume that the information structure is fixed and the preferences are common knowledge. Although I do not pursue this direction here, my results can be extended to these settings.

In a rather different environment, Rey and Salanie [18] obtain a similar result in that a small degree of commitment power is sufficient for the principal to achieve efficient outcomes. They study the multi-period principal agent problem with adverse selection and show that renegotiable short-term contracts can generate the same outcomes as renegotiable long-term contracts.
3. An Example

There is a principal (she) who must take a decision $p \in \mathbb{R}$ and an agent (he) who has private information $\omega$ (his type) drawn from a uniform distribution on $[0,1]$. The payoff of the principal is $u(p, \omega) = -(p - \omega)^2$, that of the agent is $u_a(p, \omega) = -(p - (\omega + b))^2$, where $b > 0$ is the bias of the agent. This is the setting of the main example in Crawford and Sobel [6] which has been used extensively in the literature on communication and delegation.

Holmström [10] points out that in this environment every feasible outcome can be viewed as an equilibrium of constrained delegation, where the agent is allowed to choose freely from a specified set of lotteries over decisions. This result is a twin of the Revelation Principle for the one-agent case. Consider an arbitrary game: In equilibrium, the actions of the agent result in a lottery over the final decisions. Instead of playing this game, one can ask the agent to pick a lottery directly by allowing him to choose from the set of lotteries present on the equilibrium path of the original game. Thus, without loss of generality we can concentrate on the games of constrained delegation.

Our goal is to see which outcomes of constrained delegation can be replicated through veto-based delegation. In this game, the principal selects the default decision, $p_0$, the agent makes a proposal $p$, and, finally, the principal either approves or vetoes it. In the case of a veto, the default $p_0$ is implemented. The solution concept is the Perfect Bayesian equilibrium.

The difference between constrained delegation and veto-based delegation lies in the amount of commitment power given to the principal. Under constrained delegation the principal commits to approving some proposals and prohibiting others regardless of the information she infers from the agent’s behavior. In contrast, under veto-based delegation, the principal should optimally make her approval decision given her updated beliefs.

![Figure 1](image-url)  

**Figure 1.** Constrained delegation with $P = [0, 1 - b]$. The horizontal axis is $\omega$ and the vertical axis is $p$. The agent’s bias is $b > 0$, $\omega$ is uniform on $[0,1]$. The ideal decisions for the principal and the agent are correspondingly $p^I = \omega$ and $p^I_a = \omega + b$. The bold curve represents the equilibrium outcome: the agent chooses the alternative closest to his ideal.
Consider a case of constrained delegation whereby the agent is allowed to choose from \( P = [0, 1 - b] \). Because the agent’s payoff function is a quadratic loss function in the difference between his most preferred alternative \( p_a^I = \omega + b \) and the actual choice \( p \), the agent will select the alternative from \( P \) that is the closest to \( p_a^I \). In Figure 1 the bold line represents the outcome of the agent’s decision problem. He chooses his most preferred alternative if \( \omega \in [0, 1 - b] \) and \( p = p_0 = 1 - b \) otherwise.

To replicate this outcome through veto-based delegation, set the default decision to \( p_0 = 1 - b \). There follows an equilibrium in which the agent proposes \( p = \omega + b \) for \( \omega \in [0, 1 - b] \) and \( 1 - b \) otherwise, and the principal approves any proposal on the equilibrium path, \( p \leq 1 - b \). She vetoes any proposal off the equilibrium path, \( p > 1 - b \), which leads to the default decision \( p_0 = 1 - b \).

On the equilibrium path, the principal infers \( \omega \) when \( p \in [b, 1 - b] \). She approves the proposal because the positive bias of the agent implies that the proposed decision \( p \) is better than the default decision \( p_0 \). Off the equilibrium path, the principal’s veto is optimal if, for example, she believes that \( \omega = 1 - b \), in which case \( p_0 = 1 - b \) is her ideal. The agent’s behavior is optimal since he has effectively the same choices as in the original problem.

Thus, by setting \( p_0 \) equal to the highest decision taken on the equilibrium path under constrained delegation, the principal can replicate its outcome through veto-based delegation. In fact, for these specific preferences of the principal and the agent, a similar construction can be applied to any feasible outcome.

However, there are situations in which outcomes of constrained delegation cannot be achieved through veto-based delegation. For instance, assume that \( u(p, \omega) = -(p - \omega)^2 \) and \( u_a(p, \omega) = -(p - (\omega/2 + 1/4))^2 \) and allow the agent to choose any alternative from \( P = [1/3, 2/3] \), see Figure 2. (The principal will never actually select this mechanism; still, this example aids in illustrating why veto-based delegation may be unable to reproduce some outcomes.) In this case, the agent will always choose his most preferred alternative \( p = \omega/2 + 1/4 \) for \( \omega \in [1/6, 5/6] \), \( p = 1/6 \) for \( \omega < 1/6 \) and \( p = 2/3 \) otherwise. It is impossible to find a default decision \( p_0 \) that allows replicating this outcome through veto-based delegation. Even if the agent follows the same strategy, when \( p_0 \in [1/3, 2/3] \) the principal will find it optimal to intervene and veto some of the proposals on the equilibrium path. On the other hand, if \( p_0 \in [-\infty, 1/3] \cap [2/3, +\infty] \), the agent will find it optimal to propose an alternative outside of \( P \) regardless of whether the principal will veto it. In either case, the original outcome cannot be achieved. Proposition 2 in Section 6 describes necessary and sufficient conditions under which any feasible outcome can be implemented through veto-based delegation.

4. The Model

There is a principal (she) and an agent (he). The agent has one-dimensional private information \( \omega \in \Omega \subset \mathbb{R} \), called a state of the world or a type of the agent. The principal’s prior beliefs about \( \omega \) are represented by a probability measure \( \mu_\omega(\cdot) \) with
Figure 2. Constrained delegation with $P = [1/3, 2/3]$. The horizontal axis is $\omega$ and the vertical axis is $p$. The agent’s type is uniformly distributed on $[0, 1]$. The ideal decisions for the principal and the agent are correspondingly $p^I = \omega$ and $p^I_a = \omega/2 + 1/4$. The bold curve represents the equilibrium outcome: the agent chooses the alternative closest to his ideal.

the support on $\Omega$ (this allows mass points and therefore includes the case when $\omega$ has discrete support). The principal holds the rights over a convex set of possible decisions $P \subset \mathbb{R}$. The payoffs of the principal and the agent are $u(p, \omega)$ and $u_a(p, \omega)$, where $p$ is the decision taken. Both $u(\cdot, \omega)$ and $u_a(\cdot, \omega)$ are symmetric unimodal functions: they achieve their unique global maximums correspondingly at $p = p^I(\omega)$ and $p = p^I_a(\omega)$ and strictly decrease as $p$ moves away from $p^I$ and $p^I_a$.\(^2\) The functions $p^I(\cdot)$ and $p^I_a(\cdot)$, $p^I(\cdot) \neq p^I_a(\cdot)$ are continuous, bounded, non-decreasing, and satisfy $\mu(\Omega_\omega) = 0$ for $\Omega_\omega = \{\omega' | p^I_a(\omega') = p^I_a(\omega)\}$, i.e., the probability of the states in which the most preferred decisions for the agent coincide is zero. Finally, $p^I(\cdot)$ is such that $P = \{p|p^I(\omega) = p, \omega \in \Omega\}$.\(^3\)

As discussed in Section 3 (see also Hölstrom [10]), due to the fact that in any game the agent is always free to choose any behavior regardless of his type, the knowledge of the final decisions taken on the equilibrium path is sufficient to characterize the equilibrium outcome; the specific content of the actions available to the agent is irrelevant. Therefore, without loss of generality, a mechanism (with perfect commitment) is a set $P \subset P$.\(^4\) It induces a decision problem in which the agent receives

\(^2\)A unimodal function can be viewed as a parametrization of a strictly quasiconcave monotonic utility function defined on a two dimensional space (e.g., quasilinear preferences) whereby choices are subject to a budget constraint. Unimodality is somewhat stronger than single-peaked preferences because it rules out indifference among decisions. Also, the assumption of symmetry of the payoffs is standard in the literature. It is convenient for our analysis but the result can be modified to account for asymmetric cases.

\(^3\)This is also a standard (implicit) assumption in the literature. Even if it does not hold, one can redefine the set of feasible decisions as $P' = P \cap \{p|p = p^I(\omega)\}$. The only outcomes that may be potentially lost are strictly suboptimal from the principal’s perspective.

\(^4\)Following the literature we consider only deterministic mechanisms. This may potentially contain some loss of generality: stochastic mechanisms may outperform deterministic ones if the principal can screen the types using differences in their attitude to risk. This is impossible in our environment if, e.g., the agent’s payoff is quadratic. In this case, the optimal mechanism is deterministic.
his private information $\omega$ and chooses a decision $p \in P$ to maximize his payoff. A
mechanism is \textit{ex-ante incentive efficient} if it generates a Pareto efficient pair of the
ex-ante payoffs (i.e., there is no mechanism that yields higher expected payoffs to
the principal and the agent).\footnote{That is, I follow the concept of efficiency as defined in Holmström and Myerson \cite{12}.} It is assumed that the agent always participates in a mechanism.\footnote{Alternatively, one can impose assumptions on the preferences such that efficient mechanisms generate a higher payoff for the agent than the decision the principal would take based solely on her prior beliefs.}

I also consider mechanisms in which the principal cannot ex-ante commit to a set of allowed decisions. Instead, after observing the agent’s decision, the principal can intervene and change it. What the principal can commit to is the set of decisions available to her when overruling the agent’s choice. Hence, a \textit{mechanism with imperfect commitment} is a restricted set $P_0 \subseteq P$. It induces a game between the agent and the principal in which the agent proposes a decision $p \in P$, and the principal either approves it or overrules it with a decision from $P_0$.\footnote{This is not the most general specification of a mechanism with imperfect commitment. See Bester and Strausz \cite{4}, who study the validity of the Revelation Principle under imperfect commitment.} The solution concept for this game is the Perfect Bayesian equilibrium. That is, the agent’s proposal and the principal’s decision must be optimal given their beliefs, which, in turn, are required to be Bayesian whenever possible. (Some care should be taken when the distribution of $\omega$ is continuous.)

This definition of mechanism allows for communication, veto-based delegation, and full delegation, among other games. Under communication, the principal is free to make any decision after the agent’s proposal, which is equivalent to $P_0 = P$. Under full delegation, the principal commits not to reverse the agent’s decisions, which is equivalent to $P_0 = \emptyset$. Finally, under veto-based delegation, if the agent’s proposal is vetoed, then a fixed default decision $p_0$ is implemented. Here, the restricted decision set $P_0 = \{p_0\}$ is a singleton.

Finally, an outcome is said to be \textit{implemented through veto-based delegation} if there is some game of veto-based delegation in which this outcome is an equilibrium. The following two sections describe the conditions under which a given outcome can be implemented through veto-based delegation, but not necessarily as a unique equilibrium. Later, in Section 8, I consider the issue of multiple equilibria and show that the efficient outcomes can be implemented as a \textit{unique} equilibrium under some restrictions on out-of-equilibrium beliefs.

5. Imperfect Commitment

This section generalizes the observation that an outcome of communication can be implemented through veto-based delegation. Consider an arbitrary mechanism with \textit{imperfect commitment}. Unless this is a case of full delegation, in the equilibrium of this mechanism the principal chooses $p' \in P_0$ following some (possibly, out-of-equilibrium)
proposal by the agent. The outcome of this mechanism can be implemented through veto-based delegation. In order to do so, set \( p_0 = p' \) and construct the equilibrium strategies by modifying the strategies in the original game as follows: If in the original game the agent’s proposal was rejected, have the agent propose \( p \in P_0 \), which was implemented instead of his proposal. Otherwise, his strategy is the same as before. The principal’s strategy is to reject any proposal rejected in the original game and approve everything else. Finally, when an off-the-equilibrium-path proposal is vetoed, endow the principal with the belief that \( \omega = \omega' \), where \( p_0 = p'(\omega') \); otherwise let her have the same beliefs as in the original game.

Certainly, if these strategies and beliefs are equilibrium then the outcomes are the same in both games. It is immediately clear that the principal’s behavior off the equilibrium path is optimal given her beliefs. It is also easy to see the optimality of approving any proposal on the equilibrium path. First, after observing \( p \notin P_0 \), the principal’s beliefs are the same as in the original game and since it was optimal to approve the proposal before, it must be optimal to do so now. Second, for \( p \in P_0 \), it must be that in the original game the agent’s proposal was either \( p \), in which case it was approved, or \( p^* \neq p \), in which case it was vetoed with \( p \). It follows that for all \( \omega \) that lead to \( p \), the principal prefers \( p \) to \( p_0 \).

The agent’s behavior is also optimal. Under veto-based delegation the agent achieves the same outcome as in the original game, while any deviation available to him now was also present in the original game. Therefore, the optimality of his original behavior implies that he does not have a profitable deviation.

We have

**Proposition 1** Any outcome of any mechanism with imperfect commitment, with the exception of full delegation, can be implemented through veto-based delegation.

**Proof** Let \( p^A(\cdot) \) and \( d^V(\cdot) \) be the equilibrium strategies under imperfect commitment and \( P^A = \{ p \mid p = d^V(p^A(\omega)) \} \) be the set of implemented decisions. Choose any \( p' \) (it exists) such that \( p' = d^V(p) \) for some \( p \) and set \( p_0 = p' \). In the game of veto-based delegation define the strategies of the players by \( p^a(\omega) = d^V(p^A(\omega)) \) and

\[
d^v(p) = \begin{cases} p, & p \in P^A; \\ p_0, & \text{otherwise.} \end{cases}
\]

These strategies replicate the original outcome. For proposals off the equilibrium path, \( p \notin P^A \), set the principal belief to be any \( \omega \) such that \( p_0 = p'(\omega) \).

These strategies and beliefs are PBE and replicate the same outcome. Consider the agent. Any deviation to \( p \in P^A \), \( p \neq p^a(\omega) \) was available in the original game and therefore cannot be profitable. Any deviation to \( p \notin P^f \) results in \( p_0 \); it was also available before and hence is not profitable. For the principal, vetoing any \( p \notin P^A \) is optimal due to the manner of construction of the out-of-equilibrium beliefs. It is optimal to approve proposals \( p \in P^A \), since it was optimal to implement this decision rather than \( p_0 \) in the original game. \( \square \)
In particular,

**Corollary 1** Any outcome of communication can be implemented through veto-based delegation.

*Remark: full delegation.* One can trivially implement full delegation through veto-based delegation by choosing the default decision such that the principal will never use it – if it is possible to find such a decision. Strictly speaking, under the assumption of our model that for any \( p \in \mathbb{P} \) there exists \( \omega \in \Omega \) such that \( p = p^I(\omega) \), such implementation might be difficult. One can show that veto-based delegation can implement full delegation if and only if there exists \( \omega_0 \) such that (1) the most preferred decisions of the agent and the principal coincide \( p^I_a(\omega_0) = p^I(\omega_0) \), (2) if \( p^I_a(\omega) \geq p^I(\omega_0) \) then \( p^I(\omega) \geq (p^I(\omega_0) + p^I(\omega))/2 \), and (3) if \( p^I_a(\omega) \leq p^I(\omega_0) \) then \( p^I(\omega) \leq (p^I(\omega_0) + p^I(\omega))/2 \).

6. Perfect Commitment: The Veto-Power Principle

The previous section has shown that the principal can reproduce outcomes of mechanisms with imperfect commitment through veto-based delegation by asking the agent to propose the alternatives chosen in the original mechanism and promising to veto any deviations. The difficulty that arises if one attempts to adapt this result to the cases with perfect commitment is that the principal might be willing to veto some decisions that appear on the equilibrium path in the original mechanism. This is not an issue under imperfect commitment because in those games, by construction, every decision taken on the equilibrium path is optimal given the principal’s beliefs. In contrast, if the principal has perfect commitment, she can, in fact, commit not to overrule some of the decisions. This section is devoted to characterizing the conditions under which any outcome induced by an arbitrary mechanism without monetary transfers can be implemented through veto-based delegation.

As shown in Section 3, a sufficient condition that allows implementing a large range of incentive-compatible outcomes through veto-based delegation is that the agent is always (weakly) biased in the same direction, i.e., \( p^I(\cdot) \) and \( p^I_a(\cdot) \) do not intersect. Since these functions are continuous, this condition can be expressed as \( \text{sign}(p^I(\omega_1) - p^I_a(\omega_1)) = \text{sign}(p^I(\omega_2) - p^I_a(\omega_2)) \) for any \( \omega_1, \omega_2 \in \Omega \). Note that tangency of \( p^I(\cdot) \) and \( p^I_a(\cdot) \) is not ruled out.

When the conflict of interest varies its sign over \( \Omega \), veto-based delegation might prove powerless. The following condition is essential in characterizing when veto-based delegation can implement any incentive-compatible outcome.

**Definition 1** Preferences are called regular if for any \( \omega_1, \omega_2 \in \Omega, \omega_1 < \omega_2 \), either \( |\text{sign}(p^I(\omega_1) - p^I_a(\omega_1)) - \text{sign}(p^I(\omega_2) - p^I_a(\omega_2))| \leq 1 \) or \( p^I(\omega_2) - p^I(\omega_1) \leq p^I_a(\omega_2) - p^I_a(\omega_1) \).

Together with the monotonicity of \( p^I(\cdot) \) and \( p^I_a(\cdot) \) this definition states that preferences are regular if these functions either do not intersect (but can be tangent) or if
they intersect only once and, at the point of intersection, the slope of \( p^I(\cdot) \) is smaller than the slope of \( p^f_a(\cdot) \).

The regularity of preferences is necessary and sufficient for the Veto-Power Principle: any incentive-compatible outcome can be implemented through veto-based delegation. For this result to hold, it should be possible to find the default decision such that on the equilibrium path (1) the agent sometimes proposes this decision and (2) the principal never finds it optimal to take this decision if the agent proposes some other alternative. In particular, if the sign of the conflict of interest varies, then the above condition on the slopes of \( p^I(\cdot) \) and \( p^f_a(\cdot) \) guarantees that either the minimal or the maximal decision on the equilibrium path satisfies (1) and (2). Hence,

**Proposition 2 (Veto-Power Principle)** Any outcome of any mechanism with perfect commitment can be implemented through veto-based delegation if and only if preferences are regular.

**Proof** Sufficiency. Fix an outcome described by \( f : \Omega \rightarrow \mathbb{P} \) with the set of taken decisions \( P^f = \{ f(\omega) | \omega \in \Omega \} \). In a game of veto-based delegation with \( p_0 \in \{ \sup P^f, \inf P^f \} \), define the strategies of the players by \( p^a(\omega) = f(\omega) \) and

\[
d^a(p) = \begin{cases} p, & p \in P^f; \\ p_0, & \text{otherwise}. \end{cases}
\]

Clearly, these strategies replicate the original outcome. For proposals off the equilibrium path, \( p \notin P^f \), set the principal belief to be any \( \omega \) such that \( p_0 = p^I(\omega) \).

With a proper choice of \( p_0 \) these strategies and beliefs become PBE. Consider the agent. Any deviation to \( p' \in P^f, p' \neq f(\omega) \) was available in the original mechanism and therefore cannot be profitable. Any deviation to \( p' \notin P^f \) results in \( p_0 \). Since \( p_0 \) is either supremum or infimum (or maximum or minimum) of \( P^f \), this deviation also cannot be profitable. For the principal, vetoing any \( p \notin P^f \) is optimal by the manner of construction of the out-of-equilibrium beliefs.

Showing the optimality of approving proposals on the equilibrium path is somewhat more involved. If for all \( \omega \), \( p^I(\omega) - p^f_a(\omega) \leq 0 \), set \( p_0 = \sup P^f \). There are two possibilities. First, when \( p^I(\omega) \leq p \leq p_0 \), the optimality of approval is immediate. Second, if \( p < p^I(\omega) \) then the optimality of the agent’s strategy and the symmetry of his payoff implies \( p^f_a(\omega) - p \leq p_0 - p^f_a(\omega) \). Therefore \( p^I(\omega) - p \leq p_0 - p^f(\omega) \), which makes approval optimal. Similarly, the symmetric case is where for all \( \omega \), \( p^I(\omega) - p^f_a(\omega) \geq 0 \) and \( p_0 = \inf P^f \).

Now consider the case in which \( p^I(\omega) - p^f_a(\omega) \) varies its sign. Assume that \( P^f \) is convex. Denote by \( \omega^* \) the state at which \( p^I(\omega^*) - p^f_a(\omega^*) = 0 \). The regularity of preferences implies that this state is unique, and for \( p^f_a(\omega) \geq p^I(\omega) \) for \( \omega \geq \omega^* \) and \( p^f_a(\omega) \leq p^I(\omega) \) otherwise. Let \( \omega^- \) satisfy \( p^f_a(\omega^-) = \inf P^f \) and \( p^- = p^I(\omega^-) \). Similarly, let \( \omega^+ \) satisfy \( p^f_a(\omega^+) = \sup P^f \) and \( p^+ = p^I(\omega^+) \). Finally, denote \( p^* = (\sup P^f + \inf P^f)/2 \) and set

\[
p_0 = \begin{cases} \sup P^f, & p^I(\omega^*) \leq p^*; \\ \inf P^f, & \text{otherwise}. \end{cases}
\]
Assume \( p^I(\omega^*) \leq p^* \). For all \( \omega \geq \omega^* \), the equilibrium proposal satisfies \( p \in [p^I(\omega), p_0] \) and therefore \( p_0 - p^I(\omega) \geq p - p^I(\omega) \) which makes approval optimal. For \( \omega \leq \omega^* \), approving the proposal is optimal if \( p^I(\omega) - (p + p_0)/2 \leq 0 \). The left hand side of this inequality achieves its supremum either at \( \omega^- \) or \( \omega^* \). Thus, the proposal should be approved since \( p^I(\omega^-) - (p_0(p^I(\omega^-) + p_0))/2 \leq p^I(\omega^*) - p^* \leq 0 \).

Let us relax the assumption that \( P^f \) is convex. That is, there are one or more intervals \( (p_1, p_2) \), \( \min P^f \leq p_1 < p_2 \leq \max P^f \), excluded from \( P^f \). If \( p^I(\omega^*) \leq p_1 \) or \( p_2 \leq p^I(\omega^*) \), nothing changes in the preceding argument. Assume now that \( p_1 < p^I(\omega^*) < p_2 \). It is easy to see that \( p_2 \in [p^I(\omega), p_0] \) and hence it should be approved. Let \( \omega' \) be defined by \( p^I_a(\omega') - p_1 = p_2 - p^I_a(\omega') \). Proposal \( p_1 \) will clearly be approved if for all \( \omega \) such that \( p^I(\omega) = p_1, p^I(\omega) \leq (p_2 + p_0)/2 \). The left hand side of this inequality achieves its maximum at \( \omega' \). If \( \omega' \geq \omega^* \), then \( p^I(\omega') \leq p^I(\omega') = (p_1 + p_2)/2 \leq (p_0 + p_2)/2 \). Otherwise, \( \omega' \leq \omega^* \) and \( p^I(\omega') \leq p^I(\omega^*) \leq p^* = (p_0 + \min P^f)/2 \leq (p_0 + p_2)/2 \).

The proof for \( p^I(\omega^*) \geq p^* \) is completely analogous.

**Necessity.** If preferences are not regular, then there exist \( \omega^- < \omega^* \) such that \( p^I(\omega^-) < p^I_a(\omega^-) \) and \( p^I(\omega^+) < p^I_a(\omega^+) \). Consider an outcome

\[
f(\omega) = \begin{cases} p^I_a(\omega^-), & \omega \leq \omega^-; \\ p^I_a(\omega), & \omega^- < \omega < \omega^+; \\ p^I_a(\omega^+), & \omega^+ \leq \omega. \end{cases}
\]

This outcome is incentive-compatible but cannot be implemented through veto-based delegation. In such a game, the agent would have to propose \( p = p^I_a(\omega) \) for \( \omega^- < \omega < \omega^* \) which would allow the principal to infer \( \omega \). If \( p_0 = \min P^f = p^I_a(\omega^-) \) or \( p_0 = \max P^f = p^I_a(\omega^+) \), the principal would veto the proposals close to either \( p^I_a(\omega^-) \) or \( p^I_a(\omega^+) \). It is easy to see that no other decision could be used as a default. Either the default will not pose enough of a threat to the agent or the principal will find it profitable to veto some \( p \in P^I \) to achieve her ideal decision.

Certainly, when the Veto-Power Principle holds, the optimal outcome can be implemented through veto-based delegation.

**Corollary 2** If preferences are regular, the outcome of the mechanism with perfect commitment that yields the highest payoff to the principal can be implemented through veto-based delegation.

Another immediate consequence of this proposition is

**Corollary 3** If \( p^I(\omega) \) and \( p^I_a(\omega) \) intersect more than once, there are mechanisms whose outcomes cannot be implemented through veto-based delegation.

In special cases the condition on preferences can be formulated in a somewhat simpler form. Almost exclusively, the literature has studied quadratic payoffs with ideal decisions linear in \( \omega \). Therefore, I present
Corollary 4 If \( p^I(\omega) = a_p + b_p \omega, b_p > 0, \) and \( p'_a(\omega) = a_a + b_a \omega, b_a > 0, \) any outcome of any mechanism can be implemented through veto-based delegation if and only if either \( p^I(\omega) \) and \( p^I(\omega) \) never intersect or \( b_p < b_a. \)

As can be seen in the example from Section 3, sometimes the decision that the principal has to set as a default is rather extreme. This is due to the fact that for moderate default decisions the principal will be tempted to overrule some proposals of the agent that need to be approved. Let \( p \) and \( \overline{p} \) denote the lowest and the highest decisions that occur in some incentive-compatible outcome.

**Proposition 3** If an outcome can be implemented through veto-based delegation, then it can also be implemented through veto-based delegation with \( p_0 \in \{p, \overline{p}\}. \) There exist outcomes which can only be implemented through veto-based delegation with \( p_0 \in \{p, \overline{p}\}. \)

**Proof** The first part of the proposition has already been established in the proof of Proposition 2. The example given in Section 3 proves the second statement. In that example, the mechanism \( P = [0, 1 - b] \) can be implemented through veto-based delegation if and only if \( p_0 = 1 - b. \) If \( p_0 > 1 - b \) the agent will deviate and offer \( p = p_0 \) for \( \omega = p_0 - b. \) If \( p_0 < 1 - b, \) the principal will veto the proposals around \( p = p_0 + b. \)

Although it is useful to know when any outcome can be implemented through veto-based delegation, a more pragmatic approach would be to characterize the conditions under which a given mechanism can be implemented in this way. In general these conditions will depend on the precise functional form of prior beliefs and payoffs. However, one sufficient condition is that the implemented decision is always weakly bigger (or always weakly smaller) than the ideal decision of the principal.

**Proposition 4** Any outcome of any mechanism can be implemented through veto-based delegation if for any \( \omega_1, \omega_2 \in \Omega, |\text{sign}(p^I(\omega_1) - f(\omega_1)) - \text{sign}(p^I(\omega_2) - f(\omega_2))| \leq 1. \)

**Proof** Assume that for all \( \omega, \ p^I(\omega) - f(\omega) \leq 0. \) Set \( p_0 = \sup P^f. \) In the game of veto-based delegation define the strategies by \( p^a(\omega) = f(\omega) \) and

\[
d^*(p) = \begin{cases} 
  p, & p \in P^f; \\
  p_0, & \text{otherwise.} 
\end{cases}
\]

For the proposals off the equilibrium path, \( p \notin P^f, \) set the principal belief at any \( \omega \) such that \( p_0 = p^I(\omega). \)

Consider the agent: Any deviation to \( p' \in P^f, \ p' \neq f(\omega) \) was available in the original mechanism and therefore cannot be profitable. Any deviation to \( p' \notin P^f \) results in \( p_0; \) this deviation also cannot be profitable. For the principal, vetoing any \( p \notin P^f \) is optimal by the manner of construction of the out-of-equilibrium beliefs.
Since \( p(\omega) \leq f(\omega) \leq p_0 \), it is optimal to approve any proposal on the equilibrium path. Hence, these strategies are an equilibrium that reproduces the original outcome. The other case is symmetric.

If the regularity of preferences does not hold, there will be mechanisms that cannot be implemented through veto-based delegation. As is evident in the example in Figure 2, such mechanisms may be suboptimal. In fact, here, the optimal choice for the principal is to fully delegate decision-making to the agent. The outcome of full delegation can be implemented through veto-based delegation by setting \( p_0 = 1/2 \). More generally, it is often the case that the mechanisms that cannot be implemented through veto-based delegation are of no interest to the principal.

The above results are obtained for deterministic mechanisms. In general, the Veto-Power Principle will not hold for mechanisms with perfect commitment that allow lotteries over decisions. After observing an agent’s proposal, a risk-averse principal, for instance, will prefer to select a unique alternative rather than choose randomly among several of them. However, as discussed in footnote 4 stochastic mechanisms are mostly suboptimal.

Finally, the assumptions of boundedness, continuity, and monotonicity of \( p'(\cdot) \) and \( p'_a(\cdot) \) are not crucial for the results in this and the previous sections. Even the assumption of the symmetry of the payoffs can be somewhat relaxed at the cost of complicating the regularity condition.

7. Efficient Mechanisms

This section characterizes the set of ex-ante incentive-efficient mechanisms with perfect commitment and shows that veto-based delegation is the only mechanism with imperfect commitment that can implement them.\(^8\)

To make the analysis tractable I must impose more structure on preferences and prior beliefs. It is assumed that \( \omega \) is uniformly distributed on \([0, 1]\), \( p'(\omega) = \omega \), and \( p'_a(\omega) = b + \omega \), \( b > 0 \). In addition, \( u(p, \omega) = u(p - \omega) \) and \( u_a(p, \omega) = u_a(p - \omega - b) \) are strictly concave and symmetric around 0. I also restrict the set of possible decisions to be \( \mathbb{P} = [b, 1] \).

Remark. Holmström [10] and Melumad and Shibano [15] have obtained the characterization of the optimal mechanism for the principal for a slightly more special case where the payoffs are quadratic and \( \omega \) is distributed uniformly. Also for the quadratic case, Martimort and Semenov [14] derive the condition on the prior beliefs for the optimal mechanism to be convex. Holmström mentions, without proof, that his result can be extended to more general functions. It turns out that to do so one would have to make some additional assumptions similar to restricting the set of decisions to \( \mathbb{P} = [b, 1] \).

\(^8\)With the trivial exception of full delegation; obviously, full delegation can be implemented directly or by veto-based delegation.
Under our assumptions, the efficient mechanisms take a simple form, $P_O = [b, \overline{p}]$, $\overline{p} \geq 1 - b$: the principal allows the agent to choose freely among moderate alternatives and prohibits all extreme decisions. In particular, the optimal mechanism for the agent has $\overline{p} = 1$ and the optimal mechanism for the principal has $\overline{p} = 1 - b$. The efficient mechanisms are convex because an exclusion of an interior set does not change the average decision taken in equilibrium but increases its variance, thus, hurting both parties. (This is exactly the reason why in Dessein [7] full delegation is often better than communication.)

![Figure 3](image)

**Figure 3.** Constrained delegation with $P = \{a_1\} \cup [a_2, a_3]$. The horizontal axis is $\omega$ and the vertical axis is $p$. The agent’s bias is $b > 0$, $\omega$ is uniform on $[0, 1]$. The ideal decisions for the principal and the agent are correspondingly $p^i = \omega$ and $p^j = \omega + b$. The bold curve represents the equilibrium outcome: the agent chooses the alternative closest to his ideal.

Compare two mechanisms such that one of them has $[a_1, a_2] \in P_1$ and the other has $]a_1, a_2[ \not\in P_2$, $a_1, a_2 \in P_2$ (see, for example, Figures 1 and 3). In the first mechanism, the agent will choose $\omega + b$ for $\omega \in [a_1 - b, a_2 - b]$, while in the second he will choose $a_1$ for $\omega \in [a_1 - b, (a_1 + a_2)/2 - b]$ and $a_2$ for $\omega \in [(a_1 + a_2)/2 - b, a_2 - b]$. Due to the uniformity of distribution of $\omega$ the average realized decision and, therefore, the average distance between the ideal and the actual decision is the same in both mechanisms for either of the players. However, the variance of the realized decision is zero in the first mechanism and is strictly positive in the second mechanism. Therefore, the principal and the agent must be strictly worse off in the second mechanism due to strict concavity of their payoffs. This implies that the efficient mechanism should take the form $P_O = [\underline{p}, \overline{p}]$.

Next, notice that the principal and the agent never want to exclude low decisions. If the lowest allowed decision $\underline{p}$ exceeds $b$ then for $\omega \in [0, \overline{p} - b]$ the agent must choose $\underline{p}$, whereas both the agent and the principal would have been better off with a decision of $\omega + b$. Hence, the optimal mechanism must have $P_O = [b, \overline{p}]$.

Finally, let the mechanism be $P = [b, \overline{p}]$. In this case, the agent will choose $p = \omega + b$ for $\omega \in [0, \overline{p} - b]$ and $\overline{p}$ otherwise. The principal obtains the decision which is $b$ away from her most preferred decision for $\omega \in [0, \overline{p} - b]$ and the decision that is $|\overline{p} - \omega|$ away from her most preferred decision otherwise. Because of uniformity of the distribution of $\omega$, the principal’s payoff is maximized when $\overline{p} = 1 - b$ (see the proof in
Lemma 1 for details). At the same time, the agent’s payoff increases in $\overline{p}$ since higher values enable him to obtain decisions closer to his ideal. This allows us to conclude that every efficient mechanism must have $\overline{p} \geq 1 - b$.

Therefore,

**Lemma 1** The set of efficient mechanisms is $\mathbb{P}^E = \{[b, \overline{p}]|\overline{p} \geq 1 - b\}$. The highest payoff for the principal is achieved by $P_P = [b, 1 - b]$ and the highest payoff for the agent is achieved by $P_A = [b, 1]$.

**Proof** Let $P_1$ and $P_2$ be mechanisms that differ only in that $]a_1, a_2[ \in P_1$ and $]a_1, a_2[ \notin P_2$, where $a_1, a_2 \in P_1, P_2$. Then, the parties can achieve different payoffs in these two mechanisms only for $\omega \in \Omega^* = ]a_1 - b, a_2 - b]$. For all of these states, in equilibrium of $P_1$, the agent will select $p = \omega + b$. In equilibrium of $P_2$, however, the agent will select $p = a_1$ for $\omega \in \Omega^* = ]a_1 - b, (a_1 + a_2)/2 - b]$ and $p = a_2$ for $\omega \in \Omega^* = [(a_1 + a_2)/2 - b, a_2 - b]$. Therefore, conditional on $\Omega^*$ in these mechanisms the expected payoffs of the principal are $U(P_1|\Omega^*) = u(b)$ and $U(P_2|\Omega^*) = (U(P_2|\Omega^*) + U(P_2|\Omega^*))/2 = \left(\int_{\Omega^*} u(a_1 - \omega)\,d\omega + \int_{\Omega^*} u(a_2 - \omega)\,d\omega\right)/2 < u(b)$. Similarly, the expected payoffs of the agent are $U_a(P_1|\Omega^*) = u(0)$ and $U_a(P_2|\Omega^*) = \left(U_a(P_2|\Omega^*) + U_a(P_2|\Omega^*)\right)/2 = \left(\int_{\Omega^*} u_a(a_1 - \omega - b)\,d\omega + \int_{\Omega^*} u_a(a_2 - \omega - b)\,d\omega\right)/2 < u(b)$. This implies that any ex-ante efficient mechanism must be convex.

Next, let us show that the lowest decision in any efficient mechanism is $\overline{p}_O = b$. The alternative would be to have $\overline{p} > b$. For $\omega \in [0, \overline{p} - b)$, the agent would choose $p = \omega$ in the former case and $p = \overline{p}$ in the latter. Since $p = \omega$ is closer to the most preferred decisions of both parties, and for all other $\omega$ the chosen decision is the same in both mechanisms, it must be that $\overline{p}_O = b$.

It is left to prove that the highest decision in any efficient mechanism is $\overline{p}_O \geq 1 - b$. Since the efficient mechanism is convex and $\overline{p}_O = b$, in any such mechanism the decisions taken by the agent are

$$d(m(\omega)) = \begin{cases} \omega + b, & \omega < \overline{p} - b; \\ \overline{p}, & \text{otherwise,} \end{cases}$$

The expected payoff for the agent is $U_a(\overline{p}) = u_a(0)(\overline{p} - b) + \int_0^{1 - \overline{p}} u_a(\omega)\,d\omega$, which increases in $\overline{p}$. The expected payoff for the principal is

$$U(\overline{p}) = \begin{cases} u(b)(\overline{p} - b) + 2 \int_0^1 u(\omega)\,d\omega + \int_0^{1 - \overline{p}} u(b + \omega)\,d\omega, & \overline{p} \leq 1 - b; \\ u(b)(\overline{p} - b) + \int_0^1 u(\omega)\,d\omega + \int_0^{1 - \overline{p}} u(\omega)\,d\omega, & \text{otherwise.} \end{cases}$$

It achieves its maximum at $\overline{p}_O = 1 - b$ and decreases afterwards. Therefore, the highest payoff for the principal is achieved by $P_P = [b, 1 - b]$, the highest payoff for the agent by $P_A = [b, 1]$, and the set of efficient mechanisms is $\mathbb{P}^E$. $\square$
The uniformity of the distribution of $\omega$ is important because it ensures that prohibiting a set of (interior) alternatives does not affect the average realization of $p - \omega$. Instead of uniformity we might require that the distribution never decreases too rapidly. If, however, for some interval of $\omega$ the distribution decreased at a sufficient rate, then excluding an interior set of decisions would shift the average $p - \omega$ closer to zero, and the principal would be better off under $\hat{P} = [p_1, p_2] \cup [p_3, p_4]$. Unfortunately, in this case it is difficult to characterize the structure of efficient mechanisms.

Next, the assumption that $u(p, \omega)$ and $u_a(p, \omega)$ can be written as strictly concave functions $u(p - \omega)$ and $u_a(p - \omega - b)$ allows us to use Jensen’s inequality to show that the principal is better off not having additional variance in the realized decision. Clearly, concavity is sufficient but not necessary for this conclusion. The assumption that $u(p, \omega) = u(p - \omega)$ and $u_a(p, \omega) = u_a(p - \omega)$ can also be relaxed, but doing so creates additional difficulties similar to those generated by the non-uniformity of the distribution of $\omega$.

The symmetry of $u(p - \omega)$ allows us to derive the precise value of the lowest $p$ among all efficient mechanisms. Without this assumption the form of the mechanism remains $P_O = [b, \overline{p}]$, but the lowest value of $\overline{p}$ would depend on the specification of $u(p, \omega)$.

The above result can also be extended to non-constant biases of the agent. To accomplish this, we would have to impose a condition ensuring that excluding an interior set of alternatives from a mechanism would increase the variance of the average realization of $p - \omega$. Finally, the effect of the restriction that $P = [b, 1]$ is that the principal will never want to exclude low decisions. Otherwise, a principal who is not too risk-averse can benefit from excluding a set of decisions around $b$ since it would decrease the average realized distance between the taken decision and her most preferred decision at the cost of additional variance. In this case, some efficient mechanisms could be of the form $P_O = \{p_1\} \cup [p_2, \overline{p}]$.

I now show that veto-based delegation is essentially the only way to implement efficient mechanisms under imperfect commitment. Consider an efficient mechanism with $\overline{p} < 1$. If $P_0$ contains two or more alternatives, the outcome of the optimal mechanism will not be an equilibrium.\footnote{To avoid trivial cases in which $P_0$ contains some $p' > 1 - b$ never used by the principal, I assume that $p'$ is implemented after the principal rejects some proposals by the agent.} Let $p' \in P_0$, $p' \neq 1 - b$. If $p'$ is smaller than $1 - b$, then the principal will use it to veto some of the proposals below $1 - b$. Otherwise, if $p' > 1 - b$, for some high $\omega$ the agent will suggest a proposal which will be vetoed with $p'$. Full delegation also cannot replicate the outcome of the efficient mechanism since for large $\omega$ the agent will select alternatives above $1 - b$.

**Proposition 5** Veto-based delegation is the only mechanism with imperfect commitment that implements efficient mechanisms in $\{[b, \overline{p}] | 1 > \overline{p} \geq 1 - b\}$. The mechanism $P_A = [b, 1]$ can be implemented both through full delegation and veto-based delegation.
Proof Proposition 2 implies that these mechanisms can be implemented through veto-based delegation. To prove the rest of the proposition, first, consider full delegation. It cannot implement any of the mechanisms in \( \{ [b, \overline{p}] | 1 > \overline{p} \geq 1 - b \} \) since the agent will choose decisions \( p > \overline{p} \) for some high \( \omega \). Trivially, \( P_A = [b, 1] \) is the only mechanism that can be implemented by full delegation.

We are left with the case in which there exist (1) \( p_1, p_2 \in \mathbb{P}_0, p_1 < p_2 \) and (2) \( p', p'' \in \mathbb{P} \) such that the principal overrules \( p' \) with \( p_1 \) and \( p'' \) with \( p_2 \). There are two (overlapping) possibilities: \( p_1 < \overline{p} \) and \( p_2 > \overline{p} \).

In any equilibrium of the mechanism with \( P = [b, \overline{p}] \) the agent chooses

\[
p = \begin{cases} 
\omega + b, & \omega < \overline{p} - b; \\
\overline{p}, & \text{otherwise},
\end{cases}
\]

and for \( p < \overline{p} \) almost surely

\[
\mathbb{E}u(p' \mid p) = u(p', p - b)
\]

Let \( p_1 < \overline{p} \). Then, (1) implies that for the proposal \( p^* \) in \( [p_1, p_1 + b] \),

\[
\mathbb{E}u(p^* \mid p^*) = u(p^*, p^* - b) < u(p_1, p^* - b) = \mathbb{E}u(p_1 \mid p^*)
\]

Therefore, the principal is better off vetoing all such \( p^* \), which would destroy the desired outcome.

If \( p_2 > \overline{p} \), there exists \( \epsilon, 0 < \epsilon < p_2 - \overline{p} \) such that for \( \omega \in [p_2 - b - \epsilon, p_2 - b] \),

\[
u_a(\overline{p} - b - \omega) < u_a(p_2 - \omega - b)
\]

In this case, the agent is better off proposing some \( p'' \) that will be vetoed by \( p_2 \) rather than proposing \( \overline{p} \) for all such \( \omega \), which would destroy the desired outcome. \( \square \)

8. Beliefs Off the Equilibrium Path

The result that veto-based delegation can implement an arbitrary mechanism depends on the latitude we are allowed in choosing beliefs off the equilibrium path. Sometimes out-of-equilibrium beliefs that allow to implement a specific outcome through veto-based delegation may be deemed unreasonable. For instance, consider again the mechanism \( P = \{ a_1 \} \cup [a_2, a_3] \), whose outcome is depicted in Figure 3. It can be implemented through veto-based delegation with the default decision \( p_0 = a_3 \). In this case, there is an equilibrium in which the principal approves all proposals in \( P \) and vetoes everything else. To make the principal’s behavior optimal, one possibility is to set her belief for every out-of-equilibrium proposal at \( \omega = a_3 \). However, consider proposal \( p^{off} = (a_1 + a_2)/2 \). If the agent’s deviation were approved, he would strictly prefer to deviate from his equilibrium behavior and make this proposal if and only if \( \omega \in ((a_1 + a_2)/4, 3(a_1 + a_2)/4) \). In all these states, the principal is strictly better off.
endorsing the agent’s proposal rather than vetoing it and taking the decision \( p_0 = a_3 \). In other words, while the principal believes that the state is such that the agent would be worse off if his deviation were approved, the opposite is actually true.

This example motivates the following restriction on the out-of-equilibrium beliefs.

**Strict Equilibrium Dominance** Let \( p^{\text{off}} \) be an out-of-equilibrium proposal and let \( \Omega^* \) be the set of states for which the agent would strictly prefer such decision to the decision he achieves on the equilibrium path. Out-of-equilibrium beliefs satisfy Strict Equilibrium Dominance if they have support on \( \Omega^* \).

This requirement is similar to the Intuitive Criterion in Cho and Kreps [5]. The main differences are that here (1) payoffs from deviation are calculated assuming that the principal will approve the out-of-equilibrium proposal (that is, Step 2, p. 196, in Cho and Kreps, is not required) and (2) beliefs must be zero for the states for which the agent is indifferent about whether to deviate.

There is a reason to require a strict rather than a weak preference for the agent. For instance, in the setting with the uniform distribution of \( \omega \), quadratic payoffs, and a constant positive bias of the agent, Krishna and Morgan [13] analyze an equilibrium which can be supported by out-of-equilibrium beliefs that put all mass on the types that are indifferent about whether to deviate, although there are types that would strictly benefit from deviations. This equilibrium is the most informative (among all currently known equilibria in this game), and thus the most preferred by both parties. The off-the-equilibrium-path beliefs in this equilibrium may also be considered unreasonable. They are ruled out by the Strict Equilibrium Dominance, while they would survive its weaker analog.

Not surprisingly, under the Strict Equilibrium Dominance the results in Section 6 will not hold. Yet, the result in Proposition 5 that veto-based delegation is the only mechanism with imperfect commitment that implements the efficient outcomes remains true. Consider, for example, the outcome of the optimal mechanism for the principal, \( P = [b, 1 - b] \), where the implemented decision is \( p = \omega + b \) for \( \omega \in [0, 1 - 2b] \) and \( p = 1 - b \) otherwise. As has been shown for \( p_0 = 1 - b \), this outcome is implemented through veto-based delegation as follows: the agent proposes \( p = \omega + b \) for \( \omega \leq p_0 - b \) and \( p_0 \) otherwise, while the principal approves everything below \( p_0 \) and vetoes everything above it. The principal’s beliefs are Bayesian for the proposals on the equilibrium path and \( \omega = p_0 \) otherwise.

The only proposals off the equilibrium path are from \( [p_0, 1] \). For any of these the principal believes \( \omega = p_0 \). These beliefs satisfy the Strict Equilibrium Dominance because for \( \omega = p_0 \) the agent strictly prefers any proposal in \( [p_0, 1] \) to \( p_0 \). Finally, notice that under the Strict Equilibrium Dominance the equilibrium in this game is unique. Exactly the same argument can be applied to all other efficient mechanisms.
9. Veto-based Delegation vs. Full Delegation

Proposition 7 in Dessein [7] compares the relative performance of full delegation and veto-based delegation for fixed default decisions $p_0$ in settings where the agent has a constant positive bias, $\omega$ is distributed uniformly and payoff functions are concave. Let $b(p_0) = (1 - p_0)/3$. His result can be restated as:

(i) If $b \leq b(p_0)$, full delegation strictly dominates veto-based delegation;

(ii) If $b > b(p_0)$, veto-based delegation dominates full delegation if the principal is not too risk-averse.

This result is related to Proposition 5, which states that veto-based delegation is the only mechanism with imperfect commitment that achieves the incentive-efficient outcomes $\{[b, p] | 1 > p \geq 1 - b\}$. In particular, this means that full delegation cannot achieve the principal’s favorite outcome for any degree of risk-aversion, and is therefore payoff-inferior to veto-based delegation.

More generally, one can show that for all $p_0 > 1 - b$ the principal is strictly better off under veto-based delegation than under full delegation: it pays to exclude high decisions for any degree of risk-aversion of the principal.

Example.

If $p_0 \geq 1 - b$, $\omega$ is uniformly distributed on $[0, 1]$, $p^I(\omega) = \omega$, $p^I_0(\omega) = b + \omega$, $b > 0$, $u(p, \omega) = u(p - \omega)$ and $u_a(p, \omega) = u_a(p - \omega - b)$ are strictly concave and symmetric around 0, and $P = [b, 1]$, there is an equilibrium under veto-based delegation that yields to the principal a strictly higher payoff than does full delegation.

Proof. Consider the following equilibrium under veto-based delegation (Part (ii) of Lemma 4 in Dessein [7]). The agent proposes his ideal decision for $\omega \leq p_0 - b$ and $p_0$ otherwise. The principal approves everything below $p_0$ and vetoes everything above it. The principal’s beliefs are Bayesian for the proposals on the equilibrium path and $\omega = p_0$ otherwise (notice that these beliefs satisfy the Strict Equilibrium Dominance for $p_0 \geq 1 - b$). The agent’s behavior is optimal given that the principal vetoes anything above $p_0$. The principal’s veto is optimal given her beliefs. Due to the fact that the agent’s bias is positive, the principal cannot benefit from the veto of any proposal off the equilibrium path. When $p_0 > 1 - b$, this equilibrium yields $u(b)(p_0 - b) + \int_0^b u(\omega)d\omega + \int_0^{1-p_0} u(\omega)d\omega$ to the principal. On the other hand, under full delegation the payoff is $u(b)$. Clearly, veto-based delegation yields a higher payoff than does full delegation.

10. Conclusions

Veto-based delegation is a commonly observed decision-making arrangement. In organizations, the decisions of employees often require approval of higher-level manage-
ment. In many legal institutions one of the decision-making parties has veto rights. I show that one possible explanation for the extensive use of veto-like authority in practice may come from the fact that in the environments without monetary transfers veto-based delegation can reproduce any outcome of an arbitrary decision-making arrangement. The principal faces a trade-off between control over the final decision and the ability to deduce the agent’s information: greater control helps the principal to make better use of the information contained in the agent’s recommendation, but increases incentives for the agent to misrepresent his private information and (in equilibrium) makes the agent’s recommendation less informative. Any particular decision protocol specifies a compromise between the ability to control the final decision and the ability to infer the agent’s information. Veto-based delegation allows the principal to implement any such compromise: the principal achieves control by (credibly) threatening to veto extreme decisions and at the same time discourages the withholding of private information by approving moderate proposals.

References


