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Equilibrium informativeness in veto games ☆

Dmitry Lubensky [a,*], Eric Schmidbauer [b]

[a] Department of Business Economics and Public Policy, Kelley School of Business, Indiana University, 1309 E. Tenth St., Bloomington, IN 47405, United States
[b] Department of Economics, University of Central Florida, 4336 Scorpius St., Orlando, FL 32816, United States

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ABSTRACT

In a veto game a biased expert recommends an action that an uninformed decision maker can accept or reject for an outside option. The arrangement is ubiquitous in political institutions, corporations, and consumer markets but has seen limited use in applications due to a poor understanding of the equilibrium set and an ensuing debate over selection. We develop a simple method to construct every veto equilibrium and identify the most informative equilibrium in a setting that spans prior work. We show that Krishna and Morgan's (2001) equilibrium is maximally informative and strengthen Dessein's (2002) comparison of full delegation and veto. In an application we study the relationship between a patient and a doctor with a financial incentive to overtreat, and show that the doctor's bias harms the patient *both* through excessive treatment and information loss, that the latter can be substantial, and that insurance benefits both parties by improving communication.

1. Introduction

When an expert with an upward bias advises an uninformed decision maker, the effect of the bias depends on how the decision maker incorporates the advice. If the decision maker follows the advice exactly (i.e., full delegation), the bias induces higher actions than the decision maker prefers but allows all the expert's information to be transmitted. On the other hand, if the decision maker draws inference from the advice and then acts optimally (i.e., cheap talk), Crawford and Sobel (1982) (hereafter CS) shows that on average the actions are those preferred by the decision maker but communication is noisy.

Alternatively, the decision maker may draw inference but is restricted in his actions, as is the case in veto games in which the decision maker's only options are to accept the expert's proposal or to reject in lieu of an exogenous outside option. The veto terminology owes to a literature examining the "closed rule" governing legislative committees (Gilligan and Krehbiel, 1987, hereafter GK; Krishna and Morgan, 2001, hereafter KM), in which the full legislature may either accept a

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* Corresponding author.
E-mail addresses: dlubensk@indiana.edu (D. Lubensky), eschmidb@ucf.edu (E. Schmidbauer).

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Communication protocol	Excessive action	Noisy communication
Cheap Talk	No	Yes
Full Delegation	Yes	No
Veto Game	Yes	Yes

Fig. 1. Modes of communication.

committee's bill without amendments or reject it entirely. However the veto arrangement is exceedingly common across a variety of settings beyond legislatures. In elections, constituents vote to approve or disapprove particular policies such as the issuance of municipal debt, but cannot for instance write in an alternative monetary amount for the bond; the board of directors of a corporation often holds the power to approve or disapprove proposals but not to unilaterally enact a proposal of their own; and in healthcare, a patient may either accept or reject a doctor's orders but may not self-prescribe treatment.[1]

Aside from describing a ubiquitous institutional arrangement, the veto model also captures both of the known inefficiencies associated with biased experts. That is, in contrast to the benchmark CS and full delegation models, veto equilibria identified in the literature exhibit both noisy communication and excessive actions (see Fig. 1). Yet despite its appeal the veto approach has seen limited application in economic modeling due to an ongoing debate, starting with GK and KM, about equilibrium selection. In sender–receiver games it is common to focus on the most informative equilibrium, for instance in the canonical CS environment the equilibrium set is well-understood and the most informative equilibrium is easily identified.[2] By contrast, the veto equilibrium set is yet to be characterized. While KM's equilibrium is the most informative found to date, they note that "it appears to be difficult to characterize explicitly the most informative [veto] equilibrium," (p. 445) and this has remained an open question.

In this paper we describe the full set of veto equilibria. Doing so directly is difficult, however we employ Holmström's (1984) observation that, by the revelation principle, a sender that best responds in a veto game also best responds by truthfully revealing her type in a suitably constructed reporting game. Similar to Melumad and Shibano (1991), we show that every equilibrium is described by an interval partition of states into pooling and separating intervals, and that for each partition there is at most one action profile consistent with equilibrium, up to an initial condition. Then, we show that every equilibrium partition can be constructed by a simple method, starting with the initial condition and sequentially choosing interval endpoints which satisfy constraints that depend only on the previous endpoint. We demonstrate that a similar method can be used to construct cheap-talk equilibria as in CS, but by comparison the method for veto games involves many more free parameters and, in contrast to CS, can generate an equilibrium set that is infinite.

We then use insights from constructing the set to identify the most informative equilibrium in the commonly studied setting with a uniform distribution and quadratic loss functions. The key idea is that the status quo is attractive for some states but not others. The sender perfectly informs the receiver for states in which the receiver prefers the sender's optimal action to the status quo, but for states in which the status quo is viable, the sender communicates strategically by pooling and this results in an information loss. Using our equilibrium set characterization, we describe the minimal region of states over which pooling must occur, and then use this result to identify the most informative equilibrium for a wide range of values of the status quo.

To demonstrate the practical implications of our results, we apply the veto model to study the interaction between an informed doctor with a financial incentive to overtreat and an uninformed patient with the option to reject treatment. By focusing on the strategic behavior of both sides of the market we address a divide in the health literature where "papers on insurance and demand tend to view the supply side as competitive and accommodating; papers on supply tend to view patients as passively accepting provider recommendations" (McGuire, 2012, p. 339). In contrast to the workhorse physician-induced demand framework (i.e. full delegation) in which the doctor's bias leads only to overtreatment, in the veto model the patient is additionally harmed by the information loss stemming from the doctor's strategic misdiagnosis to forestall rejection. We show the utility loss from the latter communication effect can add substantially to the effect of a higher expected treatment, comprising up to roughly one quarter of the patient's welfare loss, and thus empirical studies focusing only on treatment level underestimate the welfare effect of financial incentives.

We also examine the role of health insurance in which the patient's ex-post cost of treatment is reduced by paying an upfront actuarially fair premium. While a standard approach predicts extra treatment due to the patient's moral hazard, in the veto equilibrium the treatment level is determined solely by the doctor's bias, and thus the sole effect of insurance is to align doctor and patient preferences and improve communication, leading to a Pareto improvement. In this way, even risk neutral patients find insurance valuable as a means to reduce the doctor's incentive to strategically misdiagnose.

While our main goal is to enable comparative statics in veto environments, by characterizing the equilibrium set and identifying its most informative element we also shed light on several issues in the existing theoretical literature. For example, GK and KM compare the informativeness of veto versus pure cheap talk and obtain conflicting results by focusing on different veto equilibria. The veto equilibrium of GK involves simpler strategies while the veto equilibrium of KM is more

[1] For additional examples of the veto arrangement see Marino (2007) and Mylovanov (2008).

[2] Chen et al. (2008) propose instead a perturbation-based criterion and show that it too selects the most informative CS equilibrium.