Divided Committees and Distortionary Vagueness

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Abstract

Delegating political authority is commonplace: voters delegate to politicians, politicians delegate to committees, and governments delegate to agencies. Scholars often study information transmission from the perspective of the principal and assume that the agent is honest, yet agents sometimes distort the truth. We show that delegating decision making to a committee, subcommittee, or agency with an agenda-setting chair reduces incentives for members to be vague. We also find that when the committee chair and the median committee member have opposing preferences, the committee transmits more precise information. Using data from the U.S. central bank committee (FOMC) during the Burns' Era, we test our theory and find evidence that FOMC language is indeed more certain when the committee is divided.

Introduction

In September 2019, European Central Bank President, Mario Draghi, made headlines when he suggested that other ECB committee members should not give off-the-record briefings to the media. Committee members' opposition to his request was swift. According to some reports, the Dutch central banker Klaas Knot retorted, "Don't worry, I will go on the record [with my dissent]."[1] Resistance to the ECB's new policy was large among ECB policy committee members: as many as 10 of the 25 committee members opposed the ECB's new monetary stimulus package.

In this paper, we present a formal theoretical model that shows that divisions on committees, such as monetary policy committees, matters for the level of strategic vagueness produced by the committee. In particular, we show how variation in the *preference alignment* of committee members, specifically whether they have similar or opposing biases, has important and henceforth unexplored implications for the clarity of their deliberations. Vagueness, we argue, has an advantage over misreporting in many contexts and policymakers know this. Yet, there are also real costs to the public when officials transmit vague information. For instance, vague information might increase public uncertainty over future policy, which can lead to voter disaffection.[2] Vagueness may also be related to non-compliance and deception (Staton and Vanberg, 2008).

Previous research suggests that vagueness can be used to generate cohesion among committee members, helping to smooth over differences (Owens and Wedeking, 2011). Given the potentially harmful effects of vagueness, the public has a deep interest in delegating authority to political institutions that will minimize the use of *distortionary vagueness*. Despite its importance, however, we have limited understanding of what types of committees emit more

[1] Splits at the ECB top table over Mario Draghiâs last big stimulus

[2] Swept up on a tide': disaffected voters flock to Brexit party across north-west

or less strategic vagueness. Is it better to delegate decision making to a single individual, a committee with an agenda setting chair, or a committee without an agenda setting chair? How do characteristics of the members themselves, such as their policy preferences, affect the strategic use of vagueness? Do committee divisions, such as those on the ECB, make the strategic use of vagueness worse or better?

To answer these questions, we develop a simple bargaining model that depicts group members deliberating over how precisely (or how vaguely) to transmit policy information to the mass public. Our model is general such that the number of members on the committee can vary from a very small committee of one (a single individual) up to a large committee of hundreds (for example a legislature). We construct a model in the tradition of an agenda setter model by Romer and Rosenthal (1978) and Romer and Rosenthal (1979). Different from this model, however, is that instead of bargaining directly over policy outcomes, committee members instead focus on the level of vagueness in political communications.[3] We assume that all committee members have an incentive to distort the public's behavior in some way, for example, by suggesting that the economy will improve, and we examine how and which institutions can constrain (or not) such behaviour.

We show that delegating to a committee with an agenda setting chair reduces distortionary vagueness relative to delegating to an individual or a group with no agenda setter. Second, we also find that when the chair and the median member of the group have opposing biases, the expected level of vagueness is lower than when members' biases are aligned. Finally, an additional, but perhaps more trivial effect is that appointing committee members with less extreme biases results in lower vagueness. For example, electing an highly biased central bank governor will result in less precise communications, however, the appointer can insure against this by appointing oppositely biased committee members.

[3]See, for instance, the models of gatekeeping in Denzau and Mackay (1983) and Crombez, Groseclose, and Krehbiel (2006).

By investigating the implications of delegating to groups of experts versus individuals, our model outlines exactly those institutional features that can prevent the strategic use of vagueness by politicians. Second, we show how competing interests on committees can help guarantee higher quality public information, which is essential for transparency (Jensen, 2002; Hollyer, Rosendorff, and Vreeland, 2011; Berliner, 2014). Finally, our paper also speaks to the literature on agent selection and optimal appointments. While our empirical investigation examines only one specific institution, the Federal Open Market Committee (FOMC), it is our view that our findings are broad enough to speak to a larger set of institutions which are tasked to help inform a broader audience.

Previous Literature

The literature on the strategic determinants of vagueness broadly identifies three keys reasons for vagueness by political agents when they are delegated authority. The first reason is that vagueness can help lubricate disagreement (Ulmer, 1971). Given a committee of differently biased actors, distortionary vagueness can be used opportunistically by committee members to ensure compromise among disagreeing factions. Empirically this argument implies that group size and group heterogeneity will be positively associated with strategic vagueness. Second, in a principal agent setting, vagueness may also be positively related to non-compliance. Vagueness can also be used to try to garner support from external actors or may indicate a lack of expertise about a particular topic (Staton and Vanberg, 2008). For example, a court not knowing detailed information about a topic may be purposely vague so as to ensure compliance with their ruling. Third, in a dynamic context, vagueness may be used so as to increase flexibility of future choices (Aragones and Neeman, 2000; Alesina and Cukierman, 1990; Meirowitz, 2005). By not committing to a specific action today, agents can (hopefully) use strategic vagueness as a means to negotiate a better deal tomorrow or to evade accountability.

Recently, legislative and judicial scholars have identified a number of reasons for and effects of vagueness, however, to our knowledge, these have not been tested in the context of monetary policy. The party politics literature, for example, shows that political parties make strategic choices both on their position and also on the level of ambiguity in their platforms (Bräuninger and Giger, 2016). Other research find that distortionary vagueness relates to how political parties are constrained by coalition members (Fortunato, 2019) as well as when campaigning (Eichorst and Lin, 2019). In judicial politics, Staton and Vanberg (2008) find that judges are sometimes more or less vague so as to manage their court's relationship with the mass public and the government and Owens and Wedeking (2011) show that committee members' preferences also matter for vagueness. In findings consistent with Ulmer (1971), Owens and Wedeking (2011) argue that ideological cohesion on the court limits the need for appeasement and therefore reduces incentives for members to be vague. Finding the opposite effect, recent research shows that politically polarized teams with ideologically diverse editors produce texts that are of higher (rather than lower) quality than information produced by more politically homogeneously groups (Shi et al., 2019).

Distinct from the literature on vagueness, the literature on delegation identifies two key advantages for delegating authority to committees.[4] First, committees act as a forum to aggregate the private information and represent preferences of its members (Gilligan and Krehbiel, 1987; Ladha, 1992; Ali et al., 2008; Chen and Eraslan, 2014). Second, group decision-making, and particularly the various voting rules they employ, can tailor the trade-off between a commitment to future policy and the flexibility to react to new circumstances (Dal Bo, 2006; Riboni and Ruge-Murcia, 2010). Third, committees, and especially monetary policy committees, can pool members' expertise and knowledge thereby creating more

[4]Holmstrom (1978) and Holmstrom (1982) are classic references in the delegation literature. Alonso and Matouschek (2008) are more recent examples.

efficient decision-making (Blinder, 2007).

In our model, we combine the literature on vagueness and delegation and study the relationship between monetary policy committee design and the strategic use of vagueness by members on the committee. The incentive for the monetary policy committee member to be vague in our model derives from his incentive to distort the actions or beliefs of the mass public. This motivation for vagueness is distinct from those listed above (appeasement, (non)compliance, or flexibility). Crucially, we assume that lower amounts of distortionary vagueness always improves public welfare (i.e. increases in transparency is beneficial).

To preview the result, we show that an individual working alone is able to distort public beliefs or actions by transmitting vague information. Interestingly, we find that the median member of a committee without an agenda setter can also more freely distort information. Secondly, however, we also find that a committee with an agenda setting chair is more constrained in his ability to be vague. Furthermore, we find that such a committee structure is especially effective when a positively (negatively) biased chair is paired with a negatively (positively) biased median committee member – which we term *Opposing Biases*. In summary, if we rank our findings in terms of the level of committee transparency, we find first that committees with *opposing biases* deliver the highest quality information, committees with chairs are second, and committees without chairs and those with only a single expert are the least transparent.

1 Model

We study a committee made up of $N \geq 1$ members. One of these members is the committee chair, labeled C. Delegation to a single agent is covered by the $N = 1$ case. In this case, the single member, C, has total power to make public policy statements. When, $N > 1$, public policy statements are passed by a simple majority rule. For simplicity, we assume that N

is odd.[5] The chair has proposer power. The other committee members can either vote to accept or reject the chair's proposal. Either the chair's proposal is accepted by a majority or it is voted down. If voted down, a default option is enacted.

The committee is assumed to have privileged access to information about an area of policy.[6] In the case of a central bank committee, this might be information regarding the true state of the economy or about the future intentions of the committee with regards to interest rate policy. In the case of a legislative committee, this might be privileged information over national security issues, or the government's future spending plans. Information is assumed to be verifiable. However, for simplicity, we assume that the cost of verification at the time of the public policy announcement is prohibitive, but will become freely available at some future date. Moreover, we assume sufficient reputation costs to make lying about information prohibitively expensive.

All else being equal, we assume that the chair and committee members have a small, unmodelled aversion to vagueness. Hence, if two potential equilibria give identical utility to the chair, we assume that the chair acts to bring about the less vague equilibrium. This assumption might reflect a disutility to the public of guessing over larger ranges that is then passed on to the chair and committee members through public disapproval.

While information that the committee sends to the public must be truthful, the committee may be vague. All committee members receive the same information, represented by $\theta \in [0, 1]$. They then must decide how precisely to convey θ to the public, P. A perfectly precise transmission of information would simply pass on θ to P. Vague transmissions imply a range of values, $\left[\underline{\theta}, \overline{\theta}\right]$, which are truthful and therefore contain θ. We call a statement's *degree of*

[5]This assumption does not substantively affect our results if we incorporate an appropriate tie-breaking rule when N is even.

[6]One reason for being vague is that the committee simply does not have enough information to be more precise. The vagueness studied here is vagueness that goes beyond any informational limits faced by the committee.

vagueness, v, the size of the range implied or $v = \overline{\theta} - \underline{\theta}$.

Our key assumption is that by making vague statements, a committee is able to manipulate P's response. Whatever actions P will take in response to a committee statement, they must incorporate expectations over θ that are based on the information transmitted by the committee. We call the absolute difference between the true θ and P's expectations, θ^e, the *degree of distortion* or d. As an example, consider the following. If the true value is $\theta = 0.81$ and the committee sends a message that effectively communicates that "θ is distributed with uniform probability between 0.8 and 0.9," then the public sets expectations at $\theta^e = 0.85$. Consequently, the degree of distortion is $d = |\theta^e - \theta| = |0.85 - 0.81| = 0.04$. Meanwhile, the degree of vagueness is $v = \overline{\theta} - \underline{\theta} = 0.9 - 0.8 = 0.1$. For simplicity, we will assume throughout that statements must be of the form "θ is distributed with uniform probability between $\underline{\theta}$ and $\overline{\theta}$." However, this can be generalized considerably.[7] We say a statement is biased upwards or to the right if $\theta^e > \theta$, that it is biased downwards or to the left if $\theta^e < \theta$, and unbiased if $\theta^e = \theta$.

For a particular θ, a distortion, y, is *feasible* if $y \in \left[\frac{-\theta}{2}, \frac{1-\theta}{2}\right]$. The limitations on the feasibility of a distortion is partially a function of assuming $\theta \in [0, 1]$ and that messages must specify a range with a uniform distribution. While these assumptions have implications for feasibility, they are not critical to the substantive conclusions we draw. The *distortion*, y, is just the degree of distortion as well as the direction (positive or negative). So in the above example, $y = 0.04$. We assume a sufficient flexibility of language such that any feasible distortion is possible. Hence, the audience, P, is freely manipulated and therefore does not factor in as a strategic actor.[8]

[7]For example, a message might imply "θ is distributed with uniform probability between 0.8 and 0.9 with a mass of 0.5 probability on 0.9." In this case, $\theta^e = 0.5\,(0.85) + 0.5\,(0.9) = 0.875$. In cases where the message is distributed with non-uniform probability, message variance may be used to determine the degree of vagueness.

[8]In the case of monetary policy, this may be because monetary policy is not a salient topic for the mass public or due to low levels of financial literacy. Even for those individuals that are interested and

Since the committee can transmit a statement that produces any feasible level of distortion, we allow the committee to directly bargain over the distortion, y. However, we assume that there is a default distortion x that results if the committee fails to agree on a bargain. x is feasible if $x \in \left[\frac{-\theta}{2}, \frac{1-\theta}{2}\right]$. That is, x is feasible only if it is feasible distortion for the committee.

The default distortion can be thought of in at least three ways. One, x represents a status quo message that will be implemented in the case of disagreement. Two, x is the result of an unmodelled continuation game where the degree of distortion is the result of an amendment game. The end result of this game is known at the time of initial bargaining through backward induction. Three, x is the equilibrium outcomes of an umodelled cheap talk game where the chair and committee members do not coordinate their speech. Instead, the public must attempt to infer information from the committee members making separate, uncoordinated transmissions. Again, committee members can predict the end result of this game at the time of initial bargaining through backward induction.

Committee members may have an incentive to distort expectations because each member i is assumed to possess a known bias, b_i. This bias may be political or it may reflect different interpretations of the objective information θ. We assume each committee member derives utility from the degree to which the audience forms expectations in line with the committee member's bias.[9] For simplicity, we model this with a quadratic loss function:

$$u_i = -\left(\theta^e - (\theta + b_i)\right)^2.$$

knowledgeable about monetary policy, while they may know that their actions are, on average, important to policy makers, they have little reason to think that their own individual actions are pivotal.

[9]It is important to note that in our model, a committee member's ideal point is dependent both on the truth and on the member's bias. So member i has the ideal point $\theta + b_i$.

Alternatively, we can write this in terms of the distortion as

$$u_i = -\left(y - b_i\right)^2.$$

Finally, the timing of the game is as follows:

1. The chair and committee members observe θ.
2. The chair proposes y to the committee.
3. The committee and chair vote simultaneously to accept or reject the chair's proposal.
4. If the committee accepts, y is transmitted to P and P forms expectations θ_y^e.
5. If the committee rejects, x is transmitted to P and P forms expectations θ_x^e.

We assume that the committee can only make credible threats about rejecting a proposal, hence we restrict attention to subgame perfect equilibria (SPE).

2 Analysis

We are primarily interested in uncovering the degree of vagueness, v, transmitted to the public in equilibrium. To this end, we focus on finding messages that are what we call *minimally vague messages*. Minimally vague messages produce a distortion y while minimizing v. Let $\underline{v}\left(y, \theta\right)$ be the degree of vagueness associated with a minimally vague message. Since we assume, all else being equal, that the chair and committee members prefer less vagueness, any equilibrium message will be minimally vague.

2.1 Institutional Constraints on Vagueness

In this section, we focus on how a committee with an agenda setting chair provides institutional constraints on vagueness versus an individual agent or a committee without an agenda setting chair. Proposition 1 presents our main result. Without loss of generality, we assume that the chair's bias is $b_C \geq 0$. Denote the degree of vagueness and distortion that results when the chair is the sole committee member (i.e. $N = 1$) as v_C and y_C respectively. Let M be a committee member with the median amount of bias, b_M. Let v_M and y_M respectively, be the amount of vagueness and distortion that would result if M was the sole committee member.[10, 11]

Proposition 1

Let $N > 1$ and assume that x is feasible so that $\frac{\theta}{2} \leq \theta + x \leq \frac{1+\theta}{2}$. The following statements characterize equilibrium message vagueness, v^*:

1. *If $b_C = b_M$, then $v^* = v_C = v_M$. We call this the "Median Chair" case.*

2. *If $b_C < |b_M|$, then $v_M \geq v^* \geq v_C$. We call this the "Constrained Committee" case.*

3. *If $b_C > |b_M|$ and either (a) $x \geq b_C$ or (b) $x \leq 2b_M - b_C$, then $v^* = v_C > v_M$. We call this the "Dominant Chair" case.*

4. *If $b_C > |b_M|$ and $b_C > x > 2b_M - b_C$, then $v_C > v^* \geq v_M$. We call this the "Constrained Chair" case.*

Proposition 1 highlights the way chair-committee structure constrains the vagueness that would result if messages were alternatively made by a single agent or a committee where the median member was unconstrained by a chair with proposer power. Ex-post the public will always prefer either the chair acting alone as a single agent or a committee without an agenda setting chair, whichever has bias closer to zero. However, ex-ante, the institutional structure of a committee with an agenda setting chair can work to reduce distortionary vagueness, acting like insurance against agents or committees with high bias levels. Intuitively, the

[10] We suppress in our notation the dependence of v_C and v_M on θ for brevity.

[11] This is also the level of vagueness that would also result if a perfectly patient committee voted up or down on all possible vagueness levels (without a strategic proposer) until one passed.

chair and median committee members represent two distinct sources of power over message vagueness. This separation of power potentially reduces vagueness since both players must agree to coordinate their message or the default option (status quo, x) is implemented.[12]

When a separation of power between the chair and median member does not exist, the chair-committee structure fails to reduce vagueness. This is highlighted by the situation where the chair is also median. In this case, the committee provides no additional constraints. Example 1 illustrates this case.

In the other cases, either the chair or median committee member prefers more vagueness. In Example 2, the median committee member has a higher bias than the chair. In this case, adding an agenda setting chair to a committee works to constrain the committee and reduce distortionary vagueness. Example 3 investigates the case where the chair is more biased than the committee. This can also be thought of as comparing delegating to a single agent to delegating to a chair that must receive approval from a committee. When the default option is very bad for the committee, the committee fails to constrain the chair leading to the Dominant Chair case. When the default option is not so bad, the committee can effectively constrain the level of vagueness preferred by the chair leading to the Constrained Chair case.

In all of our illustrative examples, we label the committee members 1 through N in order of least bias to most bias.

Example 1

(Median Chair):

Let $N = 3$ *and assume the following vector of biases* $(-0.1, 0.1, 0.2)$ *where* $b_c = b_2 = 0.1$. *Let the truth be* $\theta = 0.5$. *C's most preferred message is* $\theta \in u\,[0.5, 0.7]$ *which induces* $\theta^e = 0.6$, $y_C = 0.1$, *and* $v = 0.2$. *Since C is also the median committee member, this is also M's most*

[12] Another way to think about the committee's role in our model is that the committee functions as a collective veto player in relation to the chair's proposal. If we reverse the model and give the committee proposal power, than we would get symmetric results if the "chair" was imbued with veto power. It's also possible to imagine multiple veto players. For instance, an executive might have proposer power, but two committees (perhaps the United States Senate and House) must separately pass the proposal.

preferred message. Proposition 1 implies that this message will be proposed and accepted for all status quo distortions, x.

To see this, first consider the committee member with $b_3 = 0.2$. This committee member only weakly prefers the status quo distortion, x, if $x \geq y_C = 0.1$. If this is the case, $b_1 = -0.1$ weakly prefers y_C to x and votes for the proposal. Alternatively, if $x < y_C$, then 1 prefers the status quo while 3 prefers y_C. Either way, y_C passes and since it is C's most preferred distortion, it is proposed. Hence $v^* = v_C = 0.2$.

When $b_C \neq b_M$, then C and M must contend with each other over the level of message vagueness. The two main questions of interest are: One, when $b_C < |b_M|$, to what degree can C reduce the level of vagueness preferred by M acting alone? Two, when $b_C > |b_M|$, to what degree can M reduce the level of vagueness preferred by C acting alone?

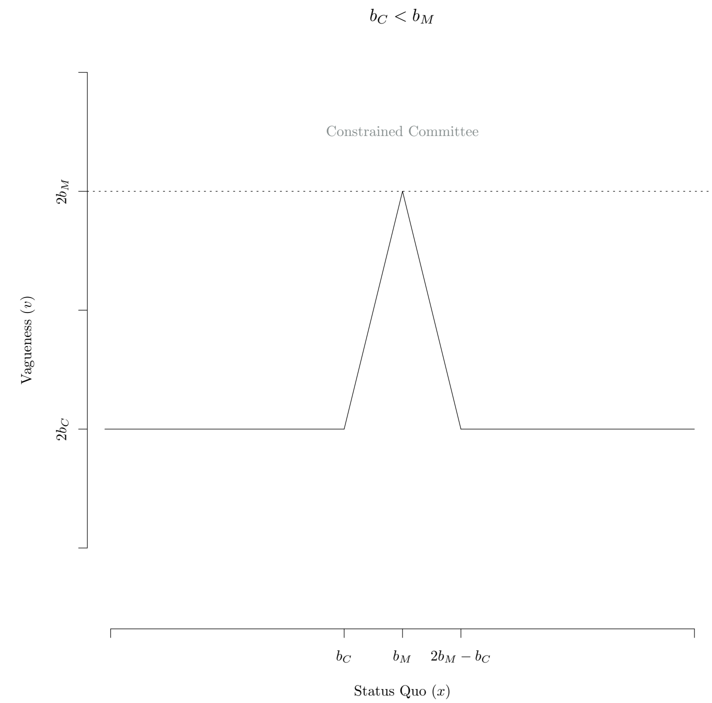
In the first case, C's proposer power allows her to constrain M's desired level of vagueness. In fact, whenever $x \notin (b_C, 2b_M - b_C)$, C is able to reduce vagueness to his most preferred level. C is able to constrain the equilibrium level of vagueness by proposing values that are at least weakly preferred by M to the status quo, x. Strikingly, even when $x > b_M$ and hence more vague than either C or M's most preferred value, C can still reduce vagueness away from M's ideal point and closer to her most preferred value. Effectively, x is sufficiently vague that C threatens M with a very unattractive, high level of vagueness if M were to reject y. So, even though the status quo may be worse for both C and M, C can leverage his proposer power to take advantage of the threat. Figure 1 illustrates this case in general, while Example 2 works it out for particular values.

Example 2

(Constrained Committee):

Let $N = 5$ and assume the following vector of biases $(-0.1, 0.1, 0.2, 0.25, 0.25)$ where $b_c = b_2 = 0.1$. Let $\theta = 0.5$. First note that M's most preferred message is $\theta \in u[0.5, 0.9]$

Figure 1: Constrained Committee



which induces $\theta^e = 0.7$*,* $y_M = 0.2$*, and* $v = 0.4$*. C's most preferred message is* $\theta \in u[0.5, 0.7]$ *which induces* $\theta^e = 0.6$*,* $y_C = 0.1$*, and* $v = 0.2$*.*

By varying x*, we can divide Example 2 into five cases:*

First*, let* $x \leq 0.1$*. In Figure 1, this corresponds to the portion of the graph to the left of* b_C*.*

In this case, C proposes $y^* = y_C = 0.1$ *and the proposal is accepted. To see that this is true, simply note that members* b_C*,* b_3*,* b_4*, and* b_5 *always weakly prefer* y_C *to* $x \leq 0.1$ *hence* y_C *will pass and since it is C's most preferred distortion, it is proposed. Hence* $v^* = v_C = 0.2$*.*

Second*, assume that* $x \in (0.1, 0.2)$*. In Figure 1, this corresponds to the portion between* b_C *and* b_M*.*

Consider the strategy where C proposes $y^* = x$. All players are indifferent between y^* and x, so it is accepted. This proposal is preferred by C to $y' > x$ while any proposal $y' < x$ will be rejected. Since $x < 0.2$, the distortion and vagueness is less than the most preferred distortion of the median committee member and the committee is constrained from what it would pass in the absence of a designated member C with proposer power. Hence, $v^* = 2x$.

***Third**, assume that $x = 0.2$. In Figure 1, this corresponds to the apex of the graph at b_M.*

Now the strategy in the first case leads to $y^* = x = y_M$. Hence, in this knife-edge case, the committee is effectively unconstrained so that the distortions and vagueness is not mitigated by the presence of the chair. Hence, $v^* = v_M = 2x = 0.4$.

***Fourth**, assume that $x \in (0.2, 0.3)$. In Figure 1, this corresponds to the portion of the graph between b_M and $2b_M - b_C$.*

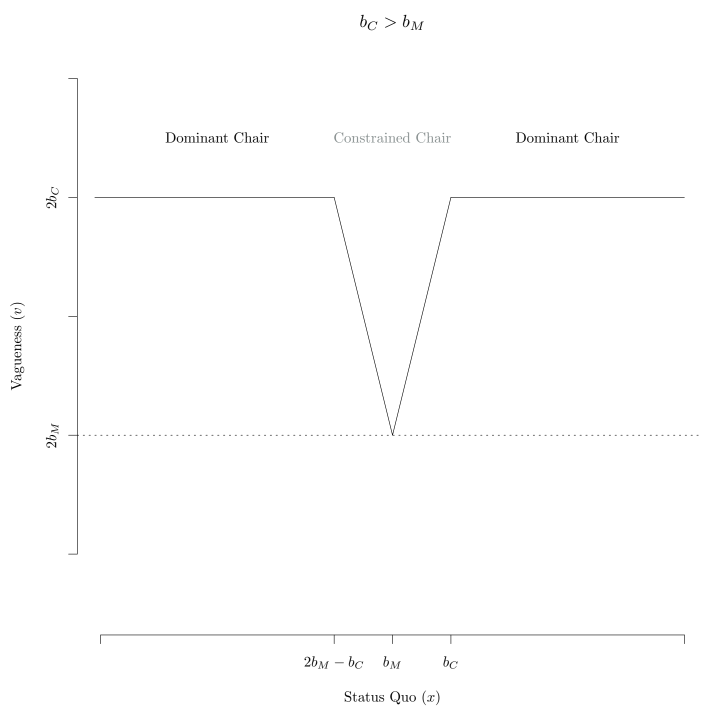
First, note that 1 will vote for any proposal such that $y < x$. Next note that M will vote for a proposal so long as $|y^* - y_M| \leq |x - y_M|$. Therefore, C proposes $y_M - (x - y_M)$ and M votes for the proposal. For instance, if $x = 0.25$, then $y^* = 0.2 - (0.25 - 0.2) = 0.15$ and $v^* = 0.3$. Or more generally, $v^* = 2\,(2y_M - x) < v_M = 2y_M$ with the inequality holding since $x > y_M$ by definition here.

***Fifth**, assume that $x \geq 0.3$. In Figure 1, this corresponds to the portion of the graph to the right of $2b_M - b_C$.*

In this case C proposes $y^* = y_C = 0.1$ and the proposal is accepted. Hence, $v^* = v_C = 0.2 < v_M = 0.4$. Note that throughout this case the committee is again constrained and vagueness is reduced from the case where the committee votes without a designated proposer.

In the second case, C now prefers greater levels of vagueness and the committee works to constrain C. However, the committee is only able to do so when $x \in (2b_M - b_C, b_C)$. Still, this can be quite a large range if b_M and b_C are far apart. Since C has proposer power, M can only effectively threaten rejection of C's most preferred value when the status quo is relatively close to M's ideal point. This is the inverse of the logic in the first case where the committee is effectively constrained for all status quo values with the exception of a single point. Figure 2 illustrates this case in general, while Example 3 works it out for particular values.

Figure 2: Dominant Chair and Constrained Chair



Example 3

(Dominant Chair and Constrained Chair): Let $N = 5$ *and assume the following vector of biases* $(-0.2, -0.1, 0.1, 0.2, 0.25)$ *where* $b_c = b_4 = 0.2$. *Let* $\theta = 0.5$. *C's most preferred message is* $\theta \in u[0.5, 0.9]$ *which induces* $\theta^e = 0.7$, $y_C = 0.2$, *and* $v = 0.4$. *M's most preferred message is* $\theta \in u[0.5, 0.7]$ *which induces* $\theta^e = 0.6$, $y_M = 0.1$, *and* $v = 0.2$.

Depending on x, there are three cases to consider:

***First**, when $x < 0$, we are in a Dominant Chair case. In Figure 2, this corresponds to the portion of the graph to the left of $2b_M - b_C$. Here, M prefers y_C to x, therefore y_C is proposed and passed.*

***Second**, if $x \in (0, 0.2)$, then M prefers x to y_C which is the Constrained Chair case. In Figure 2, this corresponds to the portion of the graph between $2b_M - b_C$ and b_C. In this case, M is indifferent between x and $y_M + |y_M - x|$ which is always greater than y_M and therefore preferred by C when $y_C \geq y_M + |y_M - x|$. Hence, C will propose $y^* = \min\{y_C, y_M + |y_M - x|\}$. For instance, if $x = 0.05$, then $y^* = \min\{0.2,\ 0.1 + (0.1 - 0.05)\} = 0.15$ and $v^* = 0.3 < v_C = 0.4$.*

***Third**, if $x \geq 0.2$, we are once again in the Dominant Chair case. In Figure 2, this corresponds to the portion of the graph to the right of b_C. As in the first case, M prefers y_C to x, therefore y_C is proposed and passed.*

2.2 Committee Composition and Vagueness

The previous section focused on how a committee's structure constrains vagueness. However, vagueness also depends on the distribution of bias among the committee members. The most obvious way this happens is that, all else equal, lowering the magnitude of bias for C and M, lowers the level of vagueness. In certain cases, we can go further than this to show a less intuitive, but potentially powerful result.

In many applications, it is interesting to consider the possibility of a small status quo or default level of vagueness. For instance, in the case of a status quo statement, it might be that the status quo is simply the truth or if the committee cannot agree on a distortion, individual members may transmit information independently (Moschella and Diodati, 2019; Ferrara, 2019). Since all transmissions are truthful by assumption, their intersection may be quite small, especially in cases where members have opposed bias and bargaining is more likely to break down. Proposition 2 demonstrates how a small status quo (or default) impacts equilibrium vagueness and the implications for when the chair and median committee member are biased in the same or opposite direction.

Proposition 2

If $\min[|b_C|, |b_M|] > 0$ *and* x *is feasible and small in the sense that* $|x| < \min[|b_C|, |b_M|]$*, then, (1), if the chair and median committee member are oppositely biased, then* $v^* = v_x$*, and (2), if the chair and median committee member are like biased then* $v^* > v_x$*.*

Proposition 2 predicts that vagueness will be higher when the chair is biased in the same direction as the median committee member, than when they are oppositely biased. Strikingly, as $x \to 0$, then $v^* \to 0$ when the chair and median committee member are oppositely biased. When both have nonzero biases and they are like biased, then v^* remains bounded away from 0 as $x \to 0$. Example 4 presents an instructive case.

Example 4

(Perfectly Precise Status Quo/ Default): Assume that there are two factions labeled "Dovish" or L and "Hawkish" or R. R and L are distinguished in that all members of R are right biased and all members of L are left biased. For simplicity, let the bias of all members of R be $b_R = 0.1$ *and for all members of party L let* $b_L = -0.1$*. Let* $x = 0$ *so that the status quo or default message is undistorted and perfectly precise.*

(1): Assume that the chair is from faction R and the median committee member is from faction L. R prefers to distort θ^e *upwards, but the committee will vote down any upward bias in favor of the unbiased status quo. C never proposes downward bias since this is worse than an unbiased outcome. Hence,* $v^* = 0$*.*

(2): Now assume that both the chair and median committee member are from faction L. Then the chair proposes its most preferred distortion $y = -0.1$ which is accepted and implies $v^* = 0.2$.

Intuitively, Proposition 2 implies that divided committees may be less vague (more transparent). For instance, consider the case when an sole central bank governor has the power to propose a degree of vagueness over a particular policy. If x is small, than Proposition 2 implies that transparency will be higher when the committee members are from different factions. Returning to the ECB example from the start of the paper, a divided ECB is predicted to be more transparent than one dominated by either a homogeneous inflation Dovish or an inflation Hawkish monetary policy committee.

3 Vagueness on the FOMC

The Federal Open Market Committee (FOMC) is the decision-making body for monetary policy in the United States. Today 8 and historically 12 times a year, FOMC committee members come together and decide on policy changes to the U.S. economy. Important for researchers, FOMC committee members' deliberations are recorded and made publicly available. Such reports include meeting transcripts, policy statements, public statements regarding the FOMC's policy decisions, Memoranda of Discussions (1967-1976), and records of Policy Actions & Minutes of Actions (1976-1992). Our empirical analyses uses a subset of these textual documents to provide an empirical test of our theory. The sample that we cover is the period under Arthur Burns's tenure (more below). From February 1970 to March 1976, our primary documents are the FOMC's Memorandum of Discussion, which summarizes the FOMC's deliberations on monetary policy in each meeting. After March 1976, the FOMC stopped producing the Memorandum of Discussion and started producing the Record of Policy Actions Minutes of Actions. These documents are the precursor to the modern FOMC minutes.

In addition to the rich set of documents and transcripts which we use for analysis, the FOMC has a number of interesting institutional features which makes it a good test of our theory. First, the FOMC committee chair is a strong agenda setter (Chappell, McGregor, and Vermilyea, 2004). The chair puts forward the initial proposal for changes to the federal funds as well as makes a suggestion for the monetary policy announcement, often but not always, at the start of the policy-meeting. For example, During Burns' tenure, which is the empirical sample that we examine, researcher estimate that Burns accounted for about 40-50 percent of the voting weight on interest rate decisions (Chappell, McGregor, and Vermilyea, 2004). Second, committee members are appointed by different channels, either through private member banks or through Presidential appointments (Chang, 2001). Variation in the appointment mechanism provides an exogenous sources of variation in members' preferences, and which are orthogonal to changes in the economy. For example, in the case of those directly appointed by the President, both Republican and Democrats tend to appoint members with more similar preferences to their own, conditional on confirmation by the Senate, and appointments are staggered across Presidential terms (Gandrud and Grafström, 2015; Chang, 2001). Committee members from Bank Districts, by contrast, are also more likely to represent their district's local conditions, especially their unemployment levels (Baerg and Lowe, 2018; Chappell, McGregor, and Vermilyea, 2004). Appointment differences, therefore, ensures that members have different policy preferences and that these preferences are independent from the preferences members have over the level of uncertainty language in their deliberations. Finally, committee members' deliberations are always released to the public, albeit with variations in time-delays. Indeed, the fact that members' decisions are made publicly available means that members have an (outside option) for dissent. All of these institutional features: a strong chair, diversity in biases or preferences, and an outside option, are features that our theory highlights as being important for strategic vagueness.

In the following section, we examine whether or not FOMC committee composition, and especially variation in the configuration of committee members' preferences, is related to the level of vagueness contained in the FOMC's reports between 1970 and 1978. As a preview of the results, we find that when the median FOMC voting member and the FOMC chair have opposing preferences, the meeting minutes contain five percent more certainty language than when the median and chair have alike preferences.

3.1 The Burns Years

The time periods for our first empirical test is from 1970-1978, covering a total of 99 FOMC meetings. This period encompasses meetings presided over by FOMC Chairman Arthur Burns, who takes the helm of the FOMC in 1970 and retires in March 1978. Burns' tenure as Chairman of the FOMC was remarkable in that it coincided with a number of momentous political and economic events. The U.S. experienced a deep recession, which was associated with rising rather than falling inflation. Following the recession, the economy was subjected to price controls, international financial shocks, such as the quadrupling of oil prices, and domestic political turmoil associated with the Vietnam War. It also has some interesting counterparts to today such as Burns presiding under a political administration preoccupied with exerting pressure, both publicly and privately, for more expansionary monetary policy (Pierce, 1979).

Importantly, during this time period, there is also large variation in whether the committee chair proposes a target interest rate close to or far away from the median and mean member's target policy rate. Indeed, and as reported in Chappell, McGregor, and Vermilyea (2004, pp 415-416), in the March 1975 meeting, the adopted funds rate was exactly equal to the median of the desired rates of the Committee's members and the median was also close to the mean. In May 1973, however, the chosen target of 7.56% was less than both the median and the mean. The target rate was instead set equal to the rate advocated by Chairman Burns, whose preferred rate was lower than all other voting members. If our theory is correct, there will be a systematic association between vague language in the published meeting Memorandum and Policy Actions & Minutes of Actions and changes in the alignment of committee members' preferences.

Returning to our example of the ECB at the start of the paper, in order to examine whether or not members' "outside option" to dissent matters, we split our sample into two: one which computes the median and mean committee member from those members with voting rights at any given meeting and a second sample where the median's and mean's preferences are estimated from all committee members of the FOMC.[13] The FOMC committee rotation system enables only a subset of all committee members to vote at any given meeting. A maximum of twelve members vote out of a possible nineteen members. Importantly, members cannot self-select into the official voting calendar, with official voting determined by a preset schedule, which is therefore exogenous to members' preferences.

3.1.1 Dependent Variable

Our main dependent variable is *distortionary vagueness*. To measure this, we downloaded the Memoranda of Discussion (1967-1976) and records of Policy Actions & Minutes of Actions (1976-1978) from the Fed's historical archives.[14] We selected all FOMC meetings between January 1970 and February 1978, for a total of 99 meetings, which completely covers Burns' tenure at the Fed. From these public record, we transform the records into a document frequency matrix using standard textual analysis techniques with the R package *quanteda* (Benoit et al., 2018). We then apply a certainty and uncertainty dictionary, and keep only those words which are dictionary keys and their associated word-counts. The dictionary keys that we use is from the Linguistic Inquiry and Word Count or "LIWC" dictionary,

[13] Arthur Burns faced a total of 63 dissents during his tenure (Thornton and Wheelock, 2014).

[14] Transcripts and other historical materials

and we use the vocabulary from the dimensions "certainty" and "uncertainty." We use this measure because we want to use measures which are used in previous literature but in other contexts. For example, Owens and Wedeking (2011), finds that committee heterogeneity is positively (rather than negatively) associated with vagueness in the judicial context using LIWC. Similarly, Eichorst and Lin (2019) use the LIWC dimensions that we use to study political parties and legislative behavior. While other measures are certainly possible, by using a well known metric, we are more confident in drawing comparisons of monetary policy with previous research findings.

In applying the LIWC dictionary to our corpora, we find significant variation in the number of certainty and uncertainty words used across FOMC meetings over this period. The maximum number of uncertainty words used in any given meeting is 80 and the maximum number of certainty words used in any given meeting is 13. To construct our dependent variable, we transform these certainty and uncertainty word-counts into a proportional response variable. Thus our dependent variable measures the share of certainty over uncertainty words for any given meeting in our sample.

3.1.2 Independent Variables

Our main independent variable is the preference alignment of the chair and median member on the FOMC. To measure committee members' preferences, we use the target interest rate for the chair, median, and mean member as estimated in Chappell, McGregor, and Vermilyea (2004). To compute members' preferences, Chappell, McGregor, and Vermilyea (2004) examine the FOMC transcripts and, employing human coders, code individual members' announced target rates across meetings. The authors succeed in using the transcripts data for 80% of all cases. For the remaining 20% of cases, the authors use a statistical model to interpolate a member's preferred policy target rate. Rather than being interested in the preferences of all members, we are interested in the alignment of the chair and the median member. We therefore generate a new variable *Opposing biases* to capture this. We code *Opposing biases* as 1 when the mean FOMC member is spatially located between the chair and the median member such that the median member is located farther away from the chair than the mean. Alternatively, we code *Opposing biases* as 0 when the median is located between the mean and the chair. In those cases where the median and the mean have the same preference, we also code this as 1. In the sample of voting memebers, this measure yields 73 cases where the median and chair have aligned preference and 26 cases where the median and chair have opposing preferences. Next, we repeat the coding procedure a second time, however, now we include members not on schedule to vote in the roll-call. As before, we code *Opposing biases* as 1 when the committee median is farther from the chair than the mean and 0 if not.

In addition to preferences and voting status, we also want to account for important characteristics about the U.S. economy, which are independent from strategic vagueness produced by deliberations on the committee. To do this, we control for the target interest rate at any given meeting. By including interest rates, we account for month to month variation in economic conditions. Secondly, we also account for year random effects. Accounting for month and year characteristics, we can be sure that variation in preferences are associated with members' inter-committee behavior rather than economic conditions. As the committee chair stays the same throughout the period so we do not include chair effects. Because we are modeling the ratio of certainty to uncertainty word counts, the statistical model that we use is a GLMM binomial model.

3.1.3 Statistical Results

The statistical results are presented in Table 1.

Model (1) confirms that when the median committee member and the chair have opposing biases, the number of certainty words in the policy meeting is higher than when they have

Table 1: Regression Results for proportion of Certainty/Uncertainty words and FOMC Opposing Biases

	Dependent variable:	
	Certainty/ Uncertainty	
	(Model 1 Voting Members)	(Model 2 Non-Voting Members)
Opposing biases	0.502***	
Opposing biases m.e.	[0.046]	
Opposing biases s.e.	(0.192,0.813)	
Opposing biases		0.305
Opposing biases m.e.		[0.028]
Opposing biases s.e		(-0.017,0.628)
Target Rate	−0.209***	−0.187***
Target Rate m.e.	[−0.019]	[−0.017]
Target Rate s.e.	(-0.344,-0.075)	(-0.315,-0.060)
Constant	−0.975**	−1.057**
	(-1.876,-0.073)	(-1.906,-0.208)
Observations	98	96
Log Likelihood	-183.392	-185.083
Year Effects	✓	✓
Akaike Inf. Crit.	374.784	378.167
Bayesian Inf. Crit.	385.124	388.424

Note: Binominal GMM, marginal effects in brackets, standard errors in parentheses **p<0.05; ***p<0.01

aligned biases. Because the model is binomial, however, in order to interpret the coefficient, we need to transform the parameters into linear marginal effects. The second row for each variable reports the marginal effects, which are highlighted in gray and given in square brackets. Going from an aligned to an opposing FOMC median (from 0 to 1) is associated with an approximately 5 percent increase in the use of certainty words in the meeting minutes for those on schedule to vote.

For the sample where members' preferences are computed from all FOMC members rather than those just on schedule to vote, the results are slightly different. Whilst the coefficient is still positive, we find a weaker and no longer statistically significant relationship between opposing bias and the level of certainty in the policy statement. Indeed, in looking at the marginal effect, we see that moving from an aligned to an opposing median member corresponds with approximately 3 percent increase in certainty language, though this is not statistically significant at conventional levels.

In terms of our control variable, we find that an increase in interest rates is associated with a reduction in the level of certainty in the language of the policy meeting. Furthermore, we find that this relationship is statistically significant and we find evidence of this negative relationship in both models. Indeed, interpreting the marginal effect from model (1), a one unit increase in interest rates is associated with a 1 percent reduction in certainty in the policy statements. Note that this effect is smaller than the estimate for our key independent variable. Comparing the results directly, we see that going from an aligned committee to an opposing committee yields a five-percent increase in certainty language whereas an increase in the target interest rates by one percent yields a comparative reduction in certainty language by one-percent.

4 Conclusion

In this paper we have proposed distortionary vagueness as an important feature of political delegation to a committee. We have characterized the ways committee structure (institutional design) and committee composition impacts transparency. We find that while ex-post, the public prefers either a committee chair acting alone as a single agent or a committee without an agenda setting chair, whichever is less biased, ex-ante, the institutional structure of a committee with an agenda setting chair and one with opposing preferences reduces strategic vagueness. In other words, factious rather than homogeneous committees are best for public information provision.

Furthermore, our findings are the opposite to previous findings in the literature on courts, which show that greater vagueness is used to lubricate inter-committee disagreement. Instead, we find that on the FOMC, divided committees use more certainty language and are thus more transparent than committees with more homogeneous preferences.[15] Our findings are important for the politics of central bank appointments, suggesting that those appoint-

[15]This also confirms results in Baerg (2020) who find the same thing using a sample of FOMC announcements from 2005 to 2008.

ing central bankers can improve central bank transparency by appointing oppositely biased committee members.

Our model isolates the effect of distortionary vagueness from other forms of vagueness as well as isolating bargaining over vagueness from other possible objects of bargaining. This allows for a relatively simple and clean result about distortionary vagueness. However, the simplicity of the model immediately points to two important extensions. First, a dynamic extension would allow one to consider both the effect of distortionary vagueness as well as vagueness for the sake of flexibility. In this context, different committee voting rules could also simultaneously impact flexibility as well as distortion. Second, committee members bargain over vagueness in isolation from bargaining over policy in our model. An interesting extension would allow for both a policy and the degree of vagueness over the policy to be bargained over at the same time. This is especially important in combination with the first extension and uncertainty over the effectiveness of, as well as the political consequences of the policy under consideration.

The empirical section tests our theoretical model on distortionary vagueness in the FOMC. We find evidence that opposing preferences are associated with a lower number of uncertainty words in the public statement, at least during the tenure of Chairman Burns. This application is perhaps an easy test of our theory as the FOMC exhibits all of those features that our model highlights as being effective: a strong chair, an opposing (or not) counterpoint in the median, the ability to take an outside offer by way of publicly dissenting to the policy, and a non-strategic public. Future work might try to test our model to other types of committees. According to our argument and findings, we show that committee diversity has transparency benefits that has henceforth been overshadowed by interest in policy.

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Online Appendix

Proof of Proposition 1

Proof. Since θ^e can be freely distorted within the range of feasibility, when C or M are the sole committee members, they can achieve their optimal distortion if feasible, so that $y_C = b_C$ and $y_M = b_M$ respectively.

The proof proceeds in four steps. The first step establishes when a player i will vote for C's proposal. The second shows that if M votes for a proposal, then it will pass. The third step establishes that equilibrium vagueness v^* is increasing in equilibrium distortions y^*. Finally, the fourth step demonstrates the comparative static results presented in Proposition 1. This requires four cases (1-4).

The **first step** is to establish that i will only vote for a proposal y if $|b_i - y| \leq |b_i - x|$. Plugging into i's utility function, y and x gives utility $u_i(y) = -(y - b_i)^2$ and $u_i(x) = -(x - b_i)^2$ which implies that i's utility is weakly higher under y exactly when $|b_i - y| \leq |b_i - x|$ holds.

The **second step** is to note that if M votes for a proposal, which only occurs if $|b_M - y| \leq |b_M - x|$, then the proposal passes otherwise it is voted down and the status quo is enacted. This is because if b_M is the median level of bias, then one of two cases must hold. Let M be the m^{th} committee member. (a) $y \geq x$ in which case $|b_i - y| \leq |b_i - x|$ for all $i > m$ or (b) $y < x$ in which case $|b_i - y| \leq |b_i - x|$ for all $i < m$. In either case, the proposal passes. On the other hand, if $|b_M - y| > |b_M - x|$, then M will not vote for the proposal, and either (a) $|b_i - y| > |b_i - x|$ for all $i > m$ or (b) $|b_i - y| > |b_i - x|$ for all $i < m$. Since at least a majority votes against the proposal, it fails and the status quo is enacted. Finally, note that C is indifferent between proposing x and a failing proposal. In this case of indifference, we assume that C proposes x which then passes.

The **third step** is to note the relationship between a distortion, y, and the implied level of vagueness, v_y. Vague transmissions imply a range of possible values $[\underline{\theta}, \overline{\theta}]$. In order to be truthful, θ must be in the range $[\underline{\theta}, \overline{\theta}]$. For any distribution, it must also be that $\theta^e \in [\underline{\theta}, \overline{\theta}]$. This range is minimized (vagueness is minimized) when when the range is set so that $\theta = \underline{\theta}$ to achieve a distortion $y > 0$ and $\theta = \overline{\theta}$ to achieve a distortion $y < 0$. Take the case where $y > 0$. Since $\theta = \underline{\theta}$ and $\theta^e = \theta + y$, it follows that $\theta^e = \underline{\theta} + y$. Taking expectations over the uniform distribution, it is also the case that $\theta^e = \underline{\theta} + \frac{\overline{\theta} - \underline{\theta}}{2}$. Taken together, this implies that $y = \frac{\overline{\theta} - \underline{\theta}}{2}$.

Hence, vagueness is increasing in the size of distortions, $d = |y|$ when $y > 0$. A symmetric argument holds for $y < 0$.

The **fourth step** is to characterize the four cases presented in Proposition 1. Recall that we are assuming that x is restricted to be feasible throughout.

Case 1 (Median Chair):

In this case $b_M = b_C$. Since C and M label the same agent, then $y_C = y_M$. Since x is always an option for a proposal, then setting $y = y_C$ implies that $|b_M - y| = |b_M - y_M| \leq |b_M - x|$. Hence, y_C is proposed and it passes. Equilibrium vagueness is then $v^* = v_C$.

For cases 2-4, we proof the case where $b_M > 0$. The case where $b_M < 0$ is symmetric with the appropriate inequality and sign reversals.

Case 2 (Constrained Committee):

In this case $b_M > b_C$. Since $b_M > b_C$, the argument in the third step implies that $v_M > v_C$.

(a) Let $x \in (b_C, b_M)$, C can propose x, which M weakly prefers to accept. Again, by the argument in step 3, the vagueness associated with x here is such that $v_M > v_x > v_C$. C prefers $y = x$ to $y > x$ since it is closer to C's ideal point. M will reject any $y < x$ since the status quo would then be strictly preferred. Hence, in this case, equilibrium vagueness is such that $v^* = v_x$ and $v_M > v^* > v_C$.

(b) Let $x = b_M$. In this case, M rejects any proposal that is not $y = x$ since M can attain y_M through reverting to the status quo. In this case, equilibrium vagueness is such that $v^* = v_x = v_M$.

(c) Let $x \in [b_M, 2b_M - b_C]$. Consider the strategy where C proposes $y = 2b_M - x$. Since, $x \leq 2b_M - b_C$, then $y_C \leq 2b_M - x$. Since $x \geq b_M$, then $y_M \geq 2b_M - x$. Hence, for proposed distortion y, $v_M \geq v_y \geq v_C$. M accepts proposal y since $|b_M - y| = |b_M - (2b_M - x)\,| = |-(b_M - x)\,| = |b_M - x|$ and rejects all proposals $y' < y$. C prefers y to all proposals $y' > y$, therefore C proposes $y = 2b_M - x$ and it is accepted. Therefore, equilibrium vagueness is $v^* = v_y$ so that $v_M \geq v^* \geq v_C$.

(d) Let $x \notin (b_C, 2b_M - b_C)$. First, let $x < b_C$. Since $y_C = b_C$ and $x < b_C < b_M$, then $|b_M - y_C| \leq |b_M - x|$, therefore the committee will accepts y_C which is C's most preferred option. Equilibrium vagueness is then $v^* = v_C$. Now assume that $x > 2b_M - b_C$. This implies that $x > 2b_M - b_C > b_M > b_C$. Therefore, $|b_M - y_C| \leq |b_M - x|$ since $|b_M - x| \geq |b_M - (2b_M - b_C)\,| = |b_C - b_M| = |b_M - b_C| = |b_M - y_C|$. Therefore the committee will accepts y_C which is C's most preferred option. Equilibrium vagueness is then $v^* = v_C$.

Case 3 (Dominant Chair):

In this case it is assumed that $b_C > b_M$.

(a) In this subcase it is assumed that $x \geq b_C$. Since $y_C = b_C$ and $b_M < b_C \leq x$, then $|b_M - y_C| \leq |b_M - x|$, therefore the committee will accepts y_C which is C's most preferred option. Equilibrium vagueness is then $v^* = v_C$.

(b) In this subcase it is assumed that $x \leq 2b_M - b_C$. This implies that $b_C > b_M \geq x$. Therefore, $|b_M - y_C| \leq |b_M - x|$ since $|b_M - x| \geq |b_M - (2b_M - b_C)| = |b_C - b_M| = |b_M - b_C| = |b_M - y_C|$. Therefore the committee will accepts y_C which is C's most preferred option. Equilibrium vagueness is then $v^* = v_C$.

Case 4 (Constrained Chair):

In this case $b_C > b_M$. Since $b_C > b_M$, the argument in the third step implies that $v_C > v_M$. (Note that the $x \notin (2b_M - b_C, b_c)$ case is covered by the "Dominant Chair" case.)

(a) Let $x \in (2b_M - b_C, b_M)$. Consider the strategy where C proposes $y = 2b_M - x$. Since, $x > 2b_M - b_C$, then $y_C > 2b_M - x$. Since $x < b_M$, then $y_M < 2b_M - x$. Hence, for proposed distortion y, $v_C > v_y > v_M$. M accepts proposal y since $|b_M - y| = |b_M - (2b_M - x)| = |-(b_M - x)| = |b_M - x|$ and rejects all proposals $y' > y$. C prefers y to all proposals $y' < y$, therefore C proposes $y = 2b_M - x$ and it is accepted. Therefore, equilibrium vagueness is $v^* = v_y$ so that $v_C > v^* > v_M$.

(b) Let $x = b_M$, M rejects any proposal that is not $y = x$ since M an attain y_M through reverting to the status quo. In this case, equilibrium vagueness is such that $v^* = v_M$.

(c) Let $x \in (b_M, b_C)$. C can propose x, which M weakly prefers to accept. Again, by the argument in step 3, the vagueness associated with x here is such that $v_C > v_x > v_M$. C prefers $y = x$ to $y < x$ since it is closer to C's ideal point. M will reject any $y > x$ since the status quo would then be strictly preferred. Hence, in this case, equilibrium vagueness is such that $v^* = v_x$ and $v_C > v^* > v_M$. □

Proof of Proposition 2

Proof. First, recall that $b_C \geq 0$ without loss of generality and by assumption in Proposition 2, it must be that this inequality holds strictly. Second, note that $|x| < \min[|b_C|, |b_M|]$ can correspond to several cases in Proposition 1. We proceed through these cases systematically.

Recall that Proposition 2 is divided into two statements (categories of committee biases), in (1) C and M have opposite biases and in (2) they have like biases.

Case 1 (Median Chair):

This case inherently falls into category (2) of Proposition 2. From the results of this case in Step 4 of Proposition 1, this case implies that $y^* = b_C = b_M > x$. By Step 3 in Proposition 1, this implies that $v^* > v_x$ and not convergent to 0 as $x \to 0$.

Case 2 (Constrained Committee):

(1) $b_M < 0$: As $x \to 0$, we must be in subcase (a) since $0 \in (-b_M, b_C)$. Therefore $v^* = v_x$ and v^* converges to 0 as $x \to 0$.

(2) $b_M > 0$: As $x \to 0$, we must be in subcase (d) since $0 < b_C$. Therefore $v^* > v_C$ as $x \to 0$ and does not converge to 0 as $x \to 0$.

Case 3 (Dominant Chair):

(1) $b_M < -b_C$: This case never occurs as $x \to 0$ since either $x \geq b_C > 0$ or $x \leq 2b_M - b_C < 0$, which means that x cannot be arbitrarily close to 0.

(2) $b_M > b_C$: From the results of this case in Step 4 of Proposition 1, this case implies that $y^* = b_C > x$. By Step 3 in Proposition 1, this implies that $v^* > v_x$ and not convergent to 0 as $x \to 0$.

Case 4 (Constrained Chair)

(1) $b_M \leq 0 \leq b_C$: This only falls into constrained chair case (Case 4) the subcase (c). This is because $0 \in (b_M, b_C)$ implies $x \in (b_M, b_C)$ under the assumptions of Proposition 2. Therefore $v^* = v_x$ and v^* converges to 0 as $x \to 0$.

(2) $0 < b_M < b_C$: This only falls into Case 4 under subcase (a) since $0 < b_M$ implies

$x \in (2b_M - b_C, b_M)$ under the assumptions of Proposition 2. When $0 < 2b_M - b_C$, we cannot be in the constrained chair case. Therefore $v^* = v_y > v_M$ and v^* does not converge to 0 as $x \to 0$. $\square$