Uncertainty and the Persuasion of Decision-Making Groups

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Abstract

In many organizations, decisions are not made by a single person but by a group. These groups often base their decisions on the advice of outsiders. Outsiders that have superior information can transmit this information in different ways. Lobbyists and other interested parties can simply give a recommendation (which is equal to soft information) or write and send a detailed report (hard information). We show that in a situation where having information about preferences is endogenous, decision-makers have a clear incentive to strategically use this information to affect the lobbyist's choice for the mode of communication. As decision-makers benefit from having the freedom to read reports, they sometimes benefit from keeping lobbyists in the dark about their initial preferences. In other cases, external certainty is preferable, as then the lobbyist automatically lobbies the right decision-maker. From the perspective of the group as a whole, internal certainty is preferable, but counter-intuitively, internal certainty does not always arise automatically, as members with extreme preferences prefer to appear moderate rather than extremist.

Keywords: lobbying, advice, information exchange, cheap-talk, DM-A model

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1 Introduction

In many situations there is not a single individual that has all decision-making power, but this power is often shared by multiple individuals. This is for example true in democratic systems and in managerial boards, where decision-makers vote about which policies and projects should be implemented. As politicians and managers are often overloaded with work and time is scarce, it is costly to discover the optimal decision in each and every instance. Hence, these decision-makers often consult lobbyists and other interested parties to make a more informed decision. In the end decision-makers have complete power about what they vote for, but in many cases decision-makers do not examine the informational content of advice, but simply rubber-stamp or ignore the adviser's recommendation. Hence, advisers have informal authority over decision-makers, depending on how congruent preferences are. In this thesis, we take the perspective of these advisers, and examine how they create the best situation for themselves. As interested parties often do not have the same preferences as decision-makers, the optimal decision from the perspective of the decision-maker will be different than that from the adviser's perspective. When members have different predispositions toward what policy should be implemented, the simple but important research question arises; whom should the adviser lobby? Should the adviser try to convince members with highly similar or very dissimilar preferences? In addition, another important question that is corollary to the main question is whether a single, or multiple decision-makers should be persuaded.

From the outset it may seem that a situation with multiple decision-makers is uninteresting as the adviser should only ensure that the median voter is convinced, as that would mean that a majority is reached. However, we show in this thesis that this is not the case, and that there are multiple other factors that determine the adviser's selection of a decision-maker, an important one being uncertainty about preferences. This thesis will specifically focus on democratic decision-making and the role of lobbyists in information exchange. Empirically, lobbyists have an impact on how politicians vote and how they make decisions. The sheer amount of resources that are spent by firms shows that this must be the case, otherwise this would be a complete waste.[1] However, the success of lobbying is not solely determined by the amount of resources that are spent by firms, but also by *how* they are spent.

An article in the Belgian newspaper "De Standaard" shows using leaked internal documents that Philip Morris - the tobacco company that produces Marlboro among other brands - has spent 500.000 euros on 161 lobbyists to persuade Members of

[1] It is imaginable that sometimes lobbyists only spend money because competitors do so as well, and not spending money and lobbying would send a bad signal.

European Parliament (MEP) regarding a new tobacco directive.[2] If implemented, the directive would put severe restrictions on the production, sale and use of tobacco. The potential effects on the profits of Philip Morris are evident, and there is a clear incentive to lobby MEPs. However, with 766 parliamentarians, lobbying every single member becomes an extremely costly endeavor. Hence, it seems to be rational to consider lobbying fewer members. An important question thus arises, namely, which of these Parliamentarians should be lobbied? This is for a large part determined by their predisposition toward the tobacco directive. As a result, it is not sufficient for Philip Morris to collect good arguments against the directive and present them in a clear way, but Philip Morris must first be certain about who should be lobbied. For this reason, lobbyists must spend resources on learning the initial positions of MEPs. From the leaked internal documents it becomes clear that this is exactly what Philip Morris has done. Some members received a negative appraisal, meaning that they were absolutely predisposed toward implementing the directive. As a result, lobbyists know that it's extremely unlikely that they can be convinced, and lobbying them becomes worthless.

The relevance of this thesis lies in the fact that cases such as the above one can be more thoroughly explained by the model. As lobbying is often a very secretive process, it is hard to find detailed cases of lobbying. However, the fact that lobbying is prevalent is undisputed, and there is a large societal value in explaining the process. As politicians in democracies have voting power over policies, they have a significant effect on societal welfare, and as a result, it is extremely important that they make correct decisions. Lobbyists can help in providing information about policies so that politicians can make more informed decisions. In this thesis we will employ a model to show how lobbyists should behave optimally, and additionally, we also show how politicians should optimally respond to lobbying attempts.

One of the most important factors that is examined is the effect of uncertainty about preferences on communication. A main result is that certainty about preferences within a political party is beneficial, as it allows for the precise diffusion of issue-relevant information between members, which is optimal for the group as a whole. However, members of political parties do not always benefit from publicly disclosing their initial preference toward a certain policy. The reason for this is that lobbyists will not put in a lot of effort to persuade members if their preferences are congruent with the lobbyist's preference. From the perspective of the lobbyist, it is always beneficial to know the preferences of members, as then the lobbyist does not have to incur costs when he observes that lobbying is unnecessary, and there are more

[2]Marjan Justaert (23/09/2013) - *Tabakslobby gaat agressief te werk.* Source: http://www.standaard.be/cnt/dmf20130923_00755181

cases in which the lobbyist get his most preferred policy. This holds as the lobbyist will have fewer incentives to write extensive reports (i.e. transmit hard information) when he knows that members can be persuaded by a simple costless message (soft information). As a result, members have no access to hard information, and must follow the adviser's recommendation, even though he might benefit from having hard information.

The structure of this thesis is as follows. First, we will start with providing a short overview of the existing economics literature on communication and advice which is relevant for this thesis. In the third section we explain the model's characteristics and subsequently explain our theoretical results with the help of formal theory. Afterwards, the theoretical results are discussed and we end with a conclusion, describing the main results and exploring new directions for research in this field.

2 Related Literature

In economics, there exists a wide range of literature which relates to issues about communication. This thesis is most closely related to three articles about the persuasion of decision-makers. A number of key insights stem from the formal work of Dewatripont and Tirole (2005). Their analysis of the mode of communication can be regarded as a seminal work in this field. They formally deduce that the mode of communication is extremely contingent on the congruence between preferences of senders and receivers. In a model in which a decision-maker can consult an adviser to know whether a project should be implemented (there is simply a binary pay-off for the decision-maker, meaning that the project can only be good or bad), the sender of a message can help the receiver to find information about this project. Crucially, the sender has to decide how he attempts to convince the decision-maker. If he does nothing, a decision-maker may potentially already be convinced that a project should be implemented (which is in line with the sender's preferences). There is a crucial difference between hard and soft information, where the former is verifiable, while the latter is not verifiable for the decision-maker. Then, in helping the decision-maker to find hard information, it can only convince him to not implement the project for some states of the world. This brings the result that more congruence does not always benefit decision-makers, as it can diminish the adviser's incentives to provide hard information. However, internal congruence is only positive for decision-makers that absolutely need hard information in order to implement a project. This is known as executive decision-making, and is the opposite of supervisory decision-making in which a decision-maker does not necessarily need hard information. In this article however, communication containing merely soft information does not contain any in-

formational content, as both the adviser and decision-maker already know how large the probability is that a project is good. The receiver only learns something new when the sender and receiver both exert effort to find out whether the project is good or bad. Their effort choices depend crucially on how important the project is and how big the probability is that the project gives a good pay-off. This probability is interpreted as congruence, as the sender always wants that the project is implemented, and a higher probability increases the alignment of preferences.

Caillaud and Tirole (2007) extend this analysis to examine a situation in which there is not one, but multiple decision-makers. This extension is extremely relevant, as there are many organizations in which groups makes decision rather than that a single individual has all decision-making power. Hence, group dynamics are an important aspect of communication as well. In Caillaud and Tirole (2007), it is found that not only external congruence matters (which is the congruence of preferences of a sponsor and a decision-maker) but also internal congruence (congruence of the preferences of members of the group). In their model, a project can only be implemented when both members of the group agree. As in Dewatripont and Tirole (2005), member's preferences are of crucial importance in determining in what way communication takes place. First, the authors separate the types of decision-makers into four distinct sub-groups. The first sub-group are hard-core opponents, and are so-called extremists that are never willing to investigate, as the cost of investigation is in expectation higher than the gains from implementing good projects. Secondly, there are mellow opponents who without further information would not implement the project. They would however choose to investigate if given the chance. Thirdly, there are moderate allies, who without further information would implement the projects, but they still gain more from investigation. Lastly, there are champions, who are also extremists, but they are unwilling to investigate for a different reason, namely that the probability that the project is good is too high, so that it does not warrant costly investigation. As a sponsor always prefers that a project is implemented, he always tries to convince members to do exactly that. However, he can either choose to send a detailed report, or to give a simple recommendation. Again, it is true that the simple recommendation does not contain any information, but the detailed report could in fact convince people to vote in favor of the project. As each member has his own probability that the project is good,[3] the sponsor has a clear pecking order of pay-offs. Firstly (given that the project can potentially be implemented) he prefers that no-one investigates, but both vote to implement. After that he prefers that the member who is most

[3]There is not always internal congruence (preferences are not nested by default), meaning that if a mellow opponent is convinced after investigation, it does not necessarily mean that a moderate ally is convinced as well.

sympathetic to the project investigates, after that the least sympathetic, and lastly both. Clearly, communication does not end after the sender has sent a report, as the members can also communicate with each other. One of the more interesting results from this article is that sending a report to a member who too strongly supports the project is not useful, as he is not able to convince the other member.

Finally, Swank's (forthcoming) DM-A model is important to review as well, as this thesis draws strongly from the set-up and characteristics of this DM-A model. In Swank's model, there is a decision-maker who consults an adviser who has information about the state of the world. In this model it is also true that congruence is not always beneficial, but there is large difference, namely that communication does contain information even if soft, as advisers do not necessarily always wish that the project is implemented. In addition, a number of other valuable insights are derived from this article, such as the benefit of extreme advisers, as their recommendations can give a lot of information when unexpected. Moreover, congruence must be sufficiently high; otherwise recommendations of soft information do not contain any information. In Swank (forthcoming) it also holds that decision-makers prefer that advisers have preferences that are equal to theirs. In that case decision-maker do not even need hard information. The benefits of reading reports are highest for lower levels of congruence. In addition, Swank looks at the effects of multiple interactions in a repeated setting, the optimal lobbyist, and uncertainty about preferences. It is especially the final factor that is crucial for this thesis, as we argue that it has a profound effect on the mode of communication. In Swank (forthcoming), there is uncertainty about the adviser's preferences, but in our thesis there is uncertainty about the decision makers' preferences. Decision-makers can thus endogenously determine how much effort the adviser exerts to attempt to persuade them, both by disclosing information about their preferences with other decision-makers and with the adviser herself.

3 Model

In formalizing the effect of uncertainty on group persuasion, Swank's DM-A model is used to analyze situations in which decision-makers consult advisers who have superior information. In the DM-A game, there is a decision maker P_i who faces a binary decision on X. He either implements the project ($X = 1$) or chooses to retain status quo ($X = 0$). We adapt this model to incorporate a situation with multiple decision-makers, but this will be explained more thoroughly below. Whether the project should be implemented depends partly on P_i's preferences toward X, and partly on an uncertain factor μ, which is uniformly distributed on $[-h, h]$. When indifferent, P_i prefers to implement the project. The decision maker's pay-offs of

implementation and status quo respectively are as follows:

$$U_{P_i}(X = 1) = p_i + \mu; \tag{1}$$

$$U_{P_i}(X = 0) = 0, \tag{2}$$

with $i = 1, 2, 3$, which means that decision-makers can have different preferences. Generally, we work with a model with three decision-makers.

The random variable μ exists as P_i is uncertain about each and every detail of the project and does not have the time or ability to investigate the project's content perfectly. To remove this uncertainty, the decision-maker can consult an adviser A. This adviser has superior information and knows the value of μ, hence, she can choose to communicate about μ with P_i. Generally, there are three possible means of communicating; the adviser can either choose to say nothing, send a cheap-talk message, or send a message containing a detailed report. Only the detailed report is considered lobbying, as it is a private message, while the cheap-talk message is public, and known by the whole group in all cases. The first option where messages never contain information can be safely ignored,[4] as it is part of an uninteresting equilibrium. The difference between the cheap-talk message and the detailed report is twofold. The cheap-talk message is both unverifiable for decision maker i, and costless for the adviser, while the detailed report is costly to write for the adviser, but (costlessly) verifiable for P_i. The strength of the cheap-talk message depends crucially on the preferences of the adviser; her payoffs are determined as follows:

$$U_A(X = 1) = a + \mu - kc_s; \tag{3}$$

$$U_A(X = 0) = -kc_s, \tag{4}$$

where a is the adviser's predisposition toward X, and c_s is the cost of writing and sending the report r to decision maker i.[5] If the adviser sends a report to multiple decision makers—i.e. if she chooses a $k = \{2, 3\}$—she faces the same cost twice or thrice. Although it's possible that an infinite number of messages can be sent by the adviser, we restrict her message space to a binary choice; namely sending either

[4] A babbling equilibrium always exists, but players always (weakly) prefer that communication is meaningful.

[5] This cost can be interpreted as the cost of getting access to a certain decision-maker or the cost of writing multiple reports that are written, taking into account the decision-maker's background and knowledge. One can argue that lobbyists send the same arguments to all decision-makers, but it is more reasonable to assume that different decision-makers with different backgrounds are more susceptible with different arguments as well. Hence, although the decision is binary and uni-dimensional, it can still be true that decision-makers want to hear arguments that are specific to their own background.

$m = m^g$ or $m = m^b$, meaning the project is 'good' or 'bad' respectively. Cheap-talk messages only contain information if the advisers has an $a \in [-h, h]$, as otherwise she always prefers that the project should be implemented ($a \geq h$) or not ($a < -h$), irrespective of μ. As we look for Perfect-Bayesian Equilibria (PBE) in which player's actions are in accordance with their beliefs, and beliefs are in accordance with Bayes' rule, it is important to already note what the decision-maker's belief is after observing the message m. If decision-maker i observes a positive message $m = m^g$ from the adviser, then his updated belief about μ is $E[\mu|m = m^g] = \frac{1}{2}(h - a)$, and after observing a negative message, his belief is $E[\mu|m = m^b] = -\frac{1}{2}(h + a)$. This is caused by the fact that an adviser only wants that the project is (not) implemented if $\mu \geq -a$ ($\mu < -a$), so that only those types send that particular message.

The factor that is crucial for this model is information about preferences. Throughout the model, we assume that all players know the adviser's bias $a \geq 0$, but not all players know the distribution of p_i. Every decision-maker knows his own type, and can choose to send hard information about his preference p_i to other decision makers and/or to the adviser.[6] We examine in a later stage what the costs and benefits are of disclosing information about the own initial preferences, as it affects the beliefs of other decision-makers and the behavior of the adviser. We explore a number of different situations in which the level of certainty about preferences varies. The situation in which all decision-makers know the preferences of other decision-makers is defined as *perfect internal certainty*, and the situation in which the adviser knows the preferences of all decision-makers in defined as *perfect external certainty*.

Moreover, it is also assumed that every member of the decision-making group can observe who is lobbied. This is an important assumption, as it ensures that other members do not need to guess whether another member's voting intention actually contains information. As a result, we do not need to worry about how a member of the group guesses how many other members have read a report, and who of them specifically.

Although we tweak the timing of the model depending on which aspects we analyze, generally the timing starts with a stage in which information about preferences can be shared. In the subsequent stage, the lobbyist determines her message strategy, and decision-makers determine their message strategy as well. In the final stage, decision-makers cast their votes and—depending on the majority's preference—the project gets implemented or not. As a basis, the timing is summarized in table 1.

[6]This message can be costlessly verified. Priors are often determined by one's historical experiences, making different priors possible. The assumption that information about these priors is hard is somewhat strange perhaps, but it works in cases in which group members know each other reasonable well, and can verify whether another member is really in favor of or against a project.

Table 1: General Timing of the Model

1. Nature draws μ, p_1, p_2, p_3 from a uniform distribution of $[-h, h]$
2. P_i observes p_i, a, A observes a and μ
3. P_i sends $m_p \in \{\emptyset, p_i\}$ to A and/or P_{-i}
4. A sends $m \in \{m^g, m^b\}$ to all P_i
5. A sends report r to k decision-makers at cost kc_s
6. All decision-makers observe m and k decision-makers observe r and thus μ
7. P_i publicly states voting intentions $X_i^{'} = \{0, 1\}$
8. P_i observes voting intentions, votes $X_i = \{0, 1\}$
9. Project X gets implemented if 2 or 3 decision-makers vote $X_i = 1$, otherwise status quo is retained; pay-offs are realized

4 Analysis

As has been discussed briefly before, two types of uncertainty are discussed. In a situation with perfect internal and external uncertainty, P_i's and A's belief about p_{-i} is that it is uniformly distributed on $[-h, h]$, and $E[p_{-i}] = 0$. This means that members and the adviser always believe that other members are in expectation moderate without further information. The benefit of internal uncertainty depends on a number of factors, including the adviser's predisposition, and the distribution of members' preferences. Naturally, internal certainty only brings about a benefit for decision-makers when some—but not all—of them have received a report. This benefit is derived from the fact that voting intentions give a more precise view of the state of the world, so that those who have not received a report make the correct decision more often. Below we analyze a number of issues and discover how they are affected by information about members' preferences.

4.1 Number of Reports

One of the main questions of this thesis is how many decision-makers should receive a report. By sending reports to more decision-makers a lobbyist incurs a higher cost, but there is also a higher probability that a project ultimately gets implemented. As is shown below, how the lobbyist determines how many decision-makers should receive a report depends crucially on a number of factors, an important one being information about preferences. Depending on the lobbyist's optimal response, information can be shared or not shared, and as a results more or less decision-makers can receive a report from the lobbyist.

Consider first a case in which the adviser is uncertain about members' preferences,

and members only know their own preference. Applying backward induction, it still holds that members vote $X_i = 1$ only if $p_i + E[\mu] \geq 0$.[7] The adviser however affects the members' belief about μ, and hence chooses her message strategy accordingly. How does the adviser determine how many decision-makers she sends a report to? First, if the adviser does completely nothing—if she doesn't send a report and if there is a babbling equilibrium in which cheap-talk messages contain no information—then the probability that the project is implemented is a half, and the adviser's expected utility is $EU_A = \frac{1}{2}(a + E[\mu]) > 0$. It is however more relevant to examine equilibria in which messages do contain information. To determine the utility of the adviser, note that that not all decision-makers follow the adviser's recommendation. This depends on the communication constraint. If the level of congruence is too small, then decision-makers with $p_i \to -h$ don't vote $X_i = 1$ after observing $m = m^g$, and decision-makers with $p_i \to h$ don't vote $X_i = 0$ after observing $m = m^b$. If these preferences differ too much, a report becomes necessary again. The cut-off points between soft and hard information (which is also called the communication constraint [Swank, forthcoming]) is determined by the strength of the message and the decision-maker's predisposition. A positive message $m = m^g$ only induces an $X_i = 1$ vote if $p_i + E[\mu|m = m^g] \geq 0$. The lower and upper bound respectively of the communication constraint are calculated as follows:

$$p_i + E[\mu|m = m^g] = 0 \iff p_i = \frac{1}{2}(a - h) \equiv \underline{a}. \tag{5}$$

$$p_i + E[\mu|m = m^b] = 0 \iff p_i = \frac{1}{2}(h + a) \equiv \bar{a}. \tag{6}$$

We show that in a situation of external uncertainty, the number of reports depends strongly on μ, a and c_s. In order to determine how many reports are sent in equilibrium, we analyze the adviser's utility in case she sends a certain number of reports, and we look at cases with different values of a when A sends one or more reports.

To determine the adviser's utility in case no report is compiled and sent, it is necessary to look at two cases. If $\mu \geq -a$, A sends $m = m^g$, and the project gets implemented if two or three decision-makers vote $X_i = 1$. The total probability that this occurs is:

$$Pr(\text{Majority votes } X_i = 1|\mu \geq -a) = 3\left(\frac{3h - a}{4h}\right)^2\left(\frac{a + h}{4h}\right) + \left(\frac{3h - a}{4h}\right)^3. \tag{7}$$

The first part of the equation is the probability that two decision-makers vote in favor of the project, and as there are three possible combinations of this, this probability

[7] Also, members will (weakly) prefer to state their true voting intentions, as it increases the probability that other decision-makers vote in accordance with the stated voting intention.

is multiplied by 3. The second part is simply the probability that all members vote favorably. The more negative the adviser's predisposition, the more likely it becomes that members are convinced by a positive recommendation. On the other hand, if $\mu < -a$, A sends $m = m^b$, and the project only gets implemented if a majority of decision-makers exceeds the upper-bound of the communication constraint and still votes $X_i = 1$.

$$Pr(\text{Majority votes } X_i = 1 | \mu < -a) = 3 \left(\frac{h-a}{4h} \right)^2 \left(\frac{3h+a}{4h} \right) + \left(\frac{h-a}{4h} \right)^3. \quad (8)$$

Equations (7) and (8) are multiplied by the probabilities that a respective positive and negative message is sent, and multiplied by the pay-offs in case the project gets implemented.[8] Hence, in total we get that the adviser's utility in case no report is sent is as follows:

$$U_A(\text{no report}) = \frac{h+a}{2h} \left(3 \left(\frac{3h-a}{4h} \right)^2 \left(\frac{a+h}{4h} \right) + \left(\frac{3h-a}{4h} \right)^3 \right) (a + \frac{h-a}{2})$$

$$+ \frac{h-a}{2h} \left(3 \left(\frac{h-a}{4h} \right)^2 \left(\frac{3h+a}{4h} \right) + \left(\frac{h-a}{4h} \right)^3 \right) (a - \frac{h+a}{2}). \quad (9)$$

An adviser may benefit from sending a report for two reasons: (1) it can persuade no-voters to vote yes when optimal, and (2) it can persuade yes-voters to vote no when optimal. This benefit depends crucially on the adviser's initial preferences. Below three cases are considered to examine the benefit of reports and the effect of the adviser's predisposition.

Case 1: $a = h$.

The benefit becomes clear if we look at a case where $a = h$. In that case cheap-talk messages carry no information, and $EU_A(\text{no report} | a = h) = \frac{1}{2}a$. By sending report r, decision-makers with $p_i < \underline{a} = 0$ can be convinced of voting $X_i = 1$. Upon observing a $\mu < 0$, A knows that she shouldn't send a report, as that could only lead to members voting $X_i = 0$. Only when $\mu > 0$ could it be worthwhile to send report r. By sending report r containing a $\mu > 0$ to a random P_i, there is a probability that he is convinced that voting $X_i = 1$ is optimal. This probability is equal to $Pr.(\mu \geq -p_i) = Pr.(p_i < \mu) = \frac{1}{2h}(h + \mu)$.

Given that this decision-maker is convinced, it must be the case that at least one other decision-maker is convinced as well. As decision-makers are uncertain about the preference of their peers, their beliefs of $E[p_{-i}] = 0$ and subsequently, observing a

[8] When the project does not get implemented, the adviser's pay-off is simply 0, and is therefore dropped from the equation.

lobbied decision-maker's voting intention leads to the belief that $E[\mu|X'_{-i} = 1] = \frac{1}{2}h$. The only decision-makers that are convinced are those whose preferences toward X are not too negative. Given that the lobbied decision-maker is convinced, the probability that a majority is convinced is $(2)(\frac{3}{4})(\frac{1}{4}) + (\frac{3}{4})^2 = \frac{15}{16}$. In addition, the project is also implemented when the lobbied decision-maker is not convinced of $X_i = 1$, while the two other decision-makers still vote $X_i = 1$. This occurs with probability $\frac{1}{16}$. As a result, the adviser's value in case she sends a report to a random (but known, from the perspective of other decision-makers) decision-maker given that $\mu > 0$ is equal to:

$$U_A(1 \text{ report to random } P_i) = \frac{1}{2h}(h + \mu)(a + \mu) - c_s. \tag{10}$$

The adviser does not benefit from sending a report for all states of the world. For low levels of μ, a report convinces too few decision-makers. Clearly, when $\mu = 0$, the report changes the belief of no-one, and as writing a report is costly, the adviser is better off not sending the report. The condition which must hold in the special case of $a = h$ is that $\mu + \frac{1}{2h}\mu^2 > c_s$, which clearly shows that μ must be sufficiently high.

The matter is more complex when $0 < a < h$, as then cheap-talk messages carry information, and sending a report becomes less necessary. In this case, it is also beneficial to send reports to convince decision-makers not to implement the project, as there is a range for which $\mu < -a$. The most valuable insight is however that sending reports is more worthwhile for more extreme states of the world, and more reports will be sent for more extreme levels of μ. The effect of the adviser's preference on sending reports is however ambiguous. On the one hand, more extreme advisers need to send more reports, as hard information is necessary to convince more decision-makers, but on the other, the optimal decision from the perspective of moderate advisers is more strongly impacted by μ, and they therefore benefit from sending reports for a wider range of μ. Looking at other extreme cases confirms this insight.

Case 2: $a = 0$.

Suppose $a = 0$. Not sending any report leads to a utility of $U_A(\text{no report}|a = 0) = \frac{1}{8}h$. Cheap-talk messages then contain the following information; $E[\mu|m = m^g] = \frac{1}{2}h, E[\mu|m = m^b] = -\frac{1}{2}h$. As members only know their own preference, voting intentions have no additional information in comparison with the adviser's recommendation. The adviser's benefit from convincing no-voters to vote yes, and yes-voters to vote no is perfectly symmetrical, hence it is only necessary to examine one of those two. Upon observing a $\mu > 0$, the adviser wants that the project is implemented. When $\mu \in [0, \frac{1}{2}h]$, it is merely costly to send the report, as $m = m^g$ already convinces a large range of voters, and sending the report can only negate the persuasion of the

cheap-talk message. There is only a benefit from sending a report when $\mu > \frac{1}{2}h$, as then more decision-makers are convinced than those with $p_i \in [-\frac{1}{2}h, h]$. For example, when $\mu = h$, all decision-makers would prefer to implement the project, but only those with $p_i > -\frac{1}{2}h$ actually do so without reading a report. The adviser benefits from sending the report, as all decision-makers who read the report implement the project, even if $p_i < -\frac{1}{2}h$. Sending one report leads to $U_A = \frac{15}{16}h - c_s$, while sending $k = 2, 3$ reports leads to $U_A = h - kc_s$, hence sending three reports is never optimal. If $\frac{1}{2}h < \mu < h$, the adviser can optimally send three reports as there is a chance that the report is not sent to the right decision-maker. For example, when two decision-makers read the report, it could be true that only one of them is convinced, while the third decision-maker's default option is to vote $X_i = 0$, but he would prefer to implement the project if he would have received the report. In contrast with observing a $\mu = h$, there could be an equilibrium in which all decision-makers receive a report if $\mu \in [\frac{1}{2}h, h)$.[9]

Case 3: $a \to \infty$.

The final extreme case that is reviewed is in which the adviser has an $a \to \infty$. As in the earlier case of $a = h$, cheap-talk messages contain no information, and reports are necessary to be able to persuade decision-makers of voting $X_i = 1$ when $p_i < 0$. In contrast with the first case, it is far more likely that reports are sent, irrespective of the costs, as the adviser's benefit of implemented projects are enormous. It is highly likely that, in a case of perfect internal and external uncertainty, all decision-makers receive a report, even though the marginal utility of an additional report becomes increasingly smaller.

Result. Reviewing these three cases reveals that the number of reports that is sent in equilibrium is endogenously determined by the adviser's predisposition toward the project, the cost of the report, and the state of the world. The direction of the effect of a and μ is not linear, as although a moderate adviser can convince more members by a simple recommendation, she sends reports when she doesn't prefer that the project is implemented as well. Moreover, when it comes to the effect of μ, better states of the world generally lead to more reports, but once $\mu \to h$, the probability that members become convinced of voting $X_i = 1$ is so high, that it is unnecessary to send a report to all members. The effect of the report's cost is however linear, and a higher cost leads to less reports in equilibrium.

[9] This is ignoring the fact that decision-makers update their beliefs when they don't get a report while hearing $m = m^g$ or $m = m^b$. If the adviser only sends reports for extreme values of μ, the informational content of cheap-talk messages is diminished, and subsequently the adviser sends more reports.

4.2 Disclosing Preferences: External Certainty

From the perspective of the decision-making group, external certainty may sometimes increase the number of reports that are sent, which is beneficial. Recall that in a situation in which the adviser has no information about members' preferences, he randomly selects a decision-maker to lobby. If P_i sends $m_p = p_i$ to A only instead of $m_p = \emptyset$, A learns P_i's type. As a result, A may learn whether it's worthwhile to send a report to that specific decision-maker. Moreover, it also affects the adviser's willingness to send reports to other decision-makers of which she is unsure of whether they are convinced by reports.

Let us for simplicity again look at the case of $a = h$. Depending on μ and c_s, the adviser determines only the number of decision-makers that get a report, irrespective of their preferences. As has been found in the analysis of the first case where $a = h$ in the previous section, reports are only sent if $\mu > 0$ and if $\mu + \frac{1}{2h}\mu^2 > c_s$. For higher levels of μ, more reports are sent than otherwise. However, no decision-maker knows the level of μ before the lobbying stage. They only know how large the probability is that they will get a report. This leads us to the following proposition.

Proposition 1. *Suppose $a = h$ and A does not send three reports under external uncertainty. Then an equilibrium exists in which all members send $m_p = p_i$ to A.*

Proof. Whenever members prefers that the project is implemented, letting A know their preference is always beneficial, for different reasons. It can either be to direct A to them, or to direct A to other decision-makers.[10]

The notion that members benefit from external certainty is explained more thoroughly below, by looking at a decision-maker's optimal decision given his type. Which decision-makers benefit most from disclosing information about their preferences to the adviser? Clearly, those with $p_i > 0$ do not benefit from disclosing their preferences directly, but they do not incur any cost either. If the adviser learns his predisposition (in an equilibrium in which one report is sent), he is now certain that he gets no report instead of having a probability of $\frac{1}{3}$ of getting a report. However, any report that the P_i with $p_i > 0$ receives only confirms that $X_i = 1$ is the best option. There is however a positive externality, which may indirectly benefit a P_i

[10]Members with highly negative preferences do have an incentive to keep the adviser in the dark about their preference, so that the adviser is redirected to the wrong decision-maker, as they very oftenly do not prefer that the project is implemented. On the other hand, A will know that this is the case, and infers that p_i must be highly negative. In addition, P_i with a negative p_i does not know in advance what the state of the world is, so there is still a strong incentive to share information with one's type with the adviser.

with $p_i > 0$. The reason is that there is now an increased probability that the *right* decision-maker receives the report if the adviser is uncertain about the other two decision makers' preferences. Subsequently, the probability that the project is implemented is increased, which benefits that decision-maker. Other decision-makers are not dependent on the member with $p_i > 0$ to direct the adviser to them, but they can do that by themselves by disclosing information about their preferences. Not every decision-maker with a negative predisposition has an incentive to share this information though. Consider for example a decision-maker with $p_i = -h$. For him, the project should only be implemented if $\mu = h$. The probability that this occurs is infinitesimal, and as a result, when the decision-maker knows his preference before sending the report, there is an infinitesimal probability that he receives a report. For members with negative (but less negative) predispositions,[11] there is a higher probability that a report can convince them, and there is subsequently a higher probability that they get a report. Obviously, they have a stronger incentive to share information about their preferences.

The incentives to decrease external uncertainty are different when $a < h$. For example, when $a = 0$, cheap-talk messages also contain information. As has been showed in the previous section, A only sends reports for more extreme states of the world due to the report's cost. Because of this, it are especially decision-makers who do not fulfill the communication constraint (i.e. those with extreme preferences) that have incentives to show that they are not easily convinced. From the perspective of the adviser, members with too extreme preferences can almost never be convinced, so still it remains true that less extreme members have somewhat higher incentives to disclose information about their preference.

The matter is different when the adviser's optimal action under uncertainty is to send reports. The more reports are sent under external uncertainty, the smaller are the incentives to disclose information about preferences. For example, when the adviser sends three reports (which happens when the adviser has a very extreme bias), any information about preferences can only mean that an equal or lower number of reports are sent. As a decision-maker, the more congruent your preferences are with those of the adviser, the less willing she is to send hard information (as in Dewatripont and Tirole, 2005). It is therefore unwise to share this information, and to keep the adviser in the dark. The same is also true to some extent when the adviser sends one or two reports. Disclosing preferences is unwise if it leads the adviser to stop sending a report to the decision-maker, but it is wise if the adviser has every incentive to send a report to the specific decision-maker, as that increases the probability of receiving a

[11] The preference can not be too moderately negative, otherwise the cost of the report prevents the adviser in compiling and sending r if $0 \leftarrow \mu$, i.e., when μ is not high enough.

report from $\frac{1}{3}$ or $\frac{2}{3}$ to 1. The positive externality to disclose preferences for members with positive biases becomes clear now, as they do not benefit from reports if $\mu > 0$, but others would, increasing the probability that the project is implemented.

4.3 Disclosing Preferences: Internal Certainty

The benefits of disclosing personal preferences have a different source for internal certainty when compared to external certainty. Increasing internal certainty has an obvious advantage for the group, as issue-relevant information can be spread more smoothly after the lobbying stage. If members only knew their own preference, they would draw the wrong conclusions after observing a lobbied member's voting intention. Although every member benefits from knowing other members' preferences (as that would give a more precise view about the state of the world), not everyone benefits from sharing this information. Some decision-makers have incentives to keep their peers uncertain about their preferences. We show that these are predominantly members with extreme preferences.

Proposition 2. *Members with extreme preferences have higher incentives not to share information about their preferences with other members than moderate members. Moderate members are more likely to send $m_p = p_i$ to other members.*

Proof. Members with extreme preferences wish to appear moderate, so that their voting intention convinces more members. In addition, moderate members prefer uncertainty as well, as long the level of congruence with the adviser is sufficiently high, or when the adviser's recommendation contains no information.

Consider for example what happens if P_i has $p_i = h$. The fact that he has read a report does not mean that his voting intentions carry informational content. The reason is that the decision-maker of this type *always* prefers that the project is implemented. Given stable beliefs of other members, if they would be uncertain about P_i's bias, they would infer from observing $X_i' = 1$ that $E[\mu] = \frac{1}{2}h$. This positive recommendation is stronger than one under certainty. Therefore, from the perspective of this decision-maker, he prefers that other decision-makers believe that he is (in expectation) a very moderate decision-maker. Given that belief, more decision-makers will follow this decision-maker's recommendation and the project gets implemented with a higher probability. The same holds for extremely negative decision-makers, but then the other way around. In contrast, less extreme decision-maker's voting intentions carry more informational content by default, as they don't always prefer

that the project is (not) implemented.

The preference of the adviser is of crucial importance, as her recommendation naturally also affects the beliefs of those who were not lobbied. A simple case is analyzed first, in which $a > h$, meaning that the adviser's recommendations carry no informational content as she always prefers that the project is implemented. Then, the only source of information is the lobbied member's voting intention after he has read a report. From the perspective of the lobbied member, he shares information about his preference whenever that makes him better off. By sharing information, he affects the probability that a majority is reached, but his message strategy remains the same. It is first necessary to look at two probabilities of reaching a majority. In the first case, P_i sends $X_i' = 1$, and either one or two other members must vote $X_i = 1$, and in the second case, P_i sends $X_i' = 0$, and two other members must vote $X_i = 1$. By sharing information about preferences, P_i may either increase or reduce the probability that other members follow a positive or negative recommendation.

$$Pr(\text{majority } |X_i' = 1) = 2(\frac{3}{4} - \frac{p_i}{4h})(\frac{1}{4} + \frac{p_i}{4h}) + (\frac{3}{4} - \frac{p_i}{4h})^2. \tag{11}$$

$$Pr(\text{majority } |X_i' = 0) = (\frac{1}{4} - \frac{p_i}{4h})^2. \tag{12}$$

In this specific case where $a \geq h$ and only one report is sent, starting from a situation where no member ever shares information about his preference, it is never beneficial to deviate and share this information.

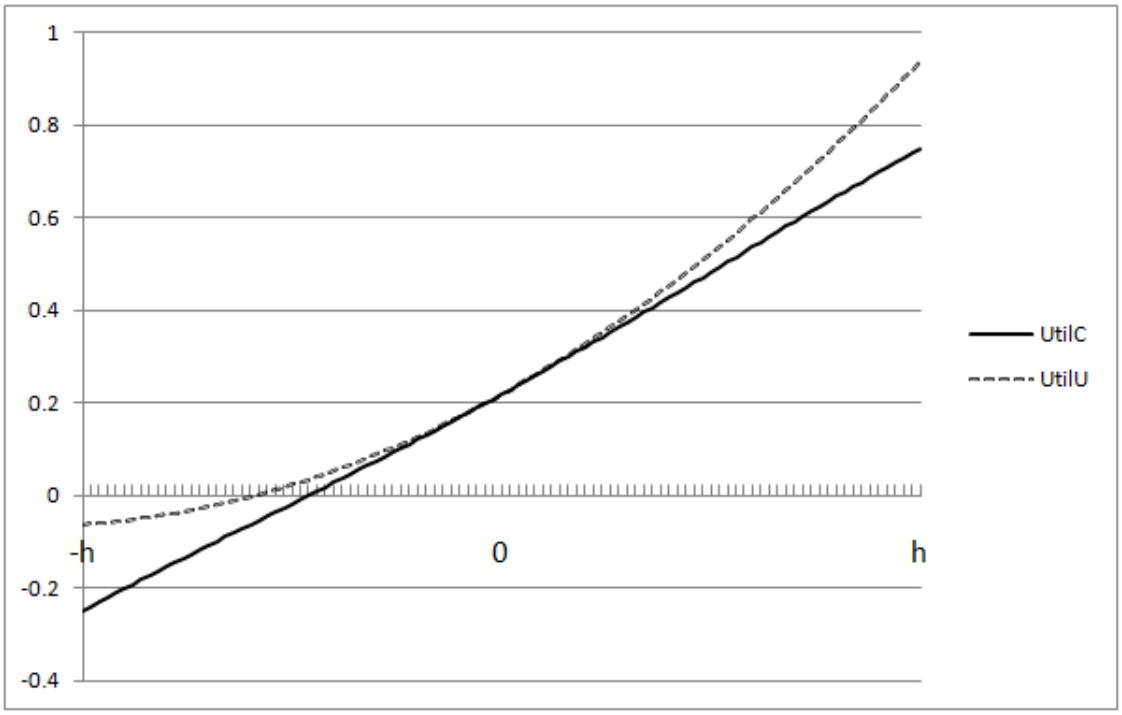
Lemma 1. If $a \geq h$ and one report is sent, an equilibrium exists in which all members send $m_p = \emptyset$ to P_{-i}.
This can be shown from the following equations and figure 1:

$$U_P(\text{certainty}) = (\frac{15}{16} - \frac{p_i}{8h} - \frac{p_i^2}{16h^2})\frac{h+p_i}{2h}\frac{h+p_i}{2} + (\frac{1}{16} - \frac{2p_i}{16h} + \frac{p_i^2}{16h^2})\frac{h-p_i}{2h}\frac{p_i-h}{2}. \tag{13}$$

$$U_P(\text{uncertainty}) = \frac{15}{16}\frac{h+p_i}{2h}\frac{h+p_i}{2} + \frac{1}{16}\frac{h-p_i}{2h}\frac{p_i-h}{2} \tag{14}$$

Clearly, as stated in the second proposition, those with extreme preferences gain the most from uncertainty, and those with the most moderate preferences gain the least, where the member with $p_i = 0$ is indifferent. Indifference is no reason to deviate and share this information, which means that an equilibrium in which no internal certainty exists is likely to arise. Although lobbied members personally benefit from not disclosing preferences, other members incur a cost because of their false beliefs.

Figure 1: Certainty versus Uncertainty



"UtilC" = A decision-maker's utility of certainty; "UtilU" = A decision maker's utility of uncertainty. For the graph: $h = 1$

However, even if members do not know *ex ante* whether they are lobbied in a case of external uncertainty, they do not gain from disclosing their preferences. There is however another way in which internal certainty can arise, and that is having an adviser who is not an 'extremist', i.e. has an $a \in (-h, h)$. In that case there is an additional cost in comparison with before, as sometimes other members follow the adviser's recommendation instead of the lobbied member's voting intention. The more in-congruent preferences of the lobbied member and adviser are, the more likely it is that this occurs.

In this case, we assume that the adviser is predisposed toward implementing the project, and has $a = \frac{1}{2}h$. When the lobbied members has a $p_i \neq \frac{1}{2}h$, the non-lobbied members update their beliefs about $E[\mu]$ differently than before. First, when they observe two messages that are congruent (i.e., if both are positive or negative recommendations), then they follow the recommendation that carries the most informational content. The player who has the least incentives to give a positive (negative) recommendation, convinces more members than those who give more positive (negative) recommendations. Moreover, whenever the preferences of the adviser and the lobbied member are not perfectly congruent, there is a possibility that those two

players disagree, and give different recommendations, which occurs with probability $|\frac{1}{2h}(a-p_i)|$.

It is necessary to consider two ranges of p_i, which depends on the adviser's bias. First, let us consider what happens if $-h < p_i \leq \frac{1}{2}h$. In that case, other members update their beliefs as follows:

$$E[\mu] = \begin{cases} \frac{1}{2}(h-p_i) & \text{if } X_i' = 1 \text{ and } m = m^g \\ -\frac{3}{4}h & \text{if } X_i' = 0 \text{ and } m = m^b \\ -\frac{1}{2}(\frac{1}{2}h+p_i) & \text{if } X_i' = 0 \text{ and } m = m^g \end{cases} \tag{15}$$

The probability that a majority is reached given a negative recommendation of the lobbied member is now increased, as disagreement leads more members to vote in favor of the project than before. This is of course costly for the lobbied member. By sharing information about one's personal predisposition, this cost can be decreased. When the two recommendations are both negative, the probability of a majority is $\frac{1}{64}h^2$, and when there are conflicting recommendations, this probability is $(\frac{3}{8}-\frac{p_i}{4h})^2$. When both recommendations are positive, the probability of a majority is equal to the case in which $a > h$. The difference between P_i's utility of uncertainty and certainty is that the former's utility sets $p_i = 0$ (instead of the actual p_i) in the first part of each of the three terms, as other members will believe that the member is perfectly moderate. The utility function of the lobbied member is now split up in three parts:

$$U_P(\text{certainty}) = \left(\frac{15}{16} - \frac{p_i}{8h} - \frac{p_i}{16h^2}\right)\frac{(h+p_i)^2}{4h} + \frac{1}{64}h^2\frac{h-a}{2h}(p_i - \frac{3}{4}h) + \left(\frac{9}{64} - \frac{3p_i}{16h} + \frac{p_i^2}{16h^2}\right)(\frac{1}{4} - \frac{p_i}{2h})(\frac{1}{2}p_i - \frac{1}{4}h); \tag{16}$$

$$U_P(\text{uncertainty}) = \frac{15}{16}\frac{(h+p_i)^2}{4h} + \frac{1}{64}h^2(\frac{h-a}{2h})(p_i - \frac{3}{4}h) + \frac{9}{64}(\frac{1}{4} - \frac{p_i}{2h})(\frac{1}{2}p_i - \frac{1}{4}h). \tag{17}$$

The same can be done for $h > p_i > \frac{1}{2}h$, with slightly different equations for the majority probabilities and informational content. In contrast to figure 1, there is now a range for which it holds that internal certainty is a preferred situation for some members. Those members with preferences p_i that are slightly below 0 have an incentive to reveal their type to other members. This directly means that an equilibrium in which there is no internal certainty cannot hold, and indirectly, many more types have an incentive to reveal their types other than those mentioned in the figure. The reason is that upon observing the fact that the lobbied member has previously revealed his type, not revealing one's type leads to a different belief than $E[p_{-i}] = 0$. As moderately negative members reveal their type, others will

believe that in expectation, a lobbied member's bias who has not revealed his type is moderately positive. As a result, the payoffs of internal uncertainty are changed. More specifically, the recommendations of members with unknown preferences carry less weight when they are positive, and more weight when they are negative. On average, positive recommendations have a higher importance than negative ones, as a positive recommendation only needs to convince one other member while a negative one only has a cost involved when two other members have an extremely positive bias. Hence, for members with negative preferences it holds that they will be even more willing to reveal their type, as their positive recommendations have a higher probability to convince the group to implement the project. Also, for more negatively predisposed members, congruence with the adviser is diminished, and as has been argued before, the member incurs a larger cost when congruence is weaker.

4.4 Selection of Decision-Makers under Certainty

Assuming that the adviser knows the preferences of all members, her selection of a decision-maker that should receive a report is a strategic one. Consider first a strategy in which A always sends report r to P_i with max $\{p_1, p_2, p_3\}$. Applying backward induction, this P_i is convinced of voting $X_i = 1$ if $\mu \geq -p_i$, otherwise he votes $X_i = 0$. Moreover, this P_i states voting intentions which are equal to his actual future vote, which he doesn't change based on observing different voting intentions of other decision-makers. As the project is only implemented if a majority votes $X_i = 1$, it is necessary that the median decision-maker votes $X_i = 1$. Logically, whenever the most opposed decision-maker votes $X_i = 1$, then it necessarily follows that the median decision-makers votes congruently.[12] Hence, it is only necessary to look at the probability that the median decision-maker is convinced by the advised decision-maker's voting intention. Recall that there is also a chance that the median decision-maker is already persuaded by the cheap-talk message m. There is only an additional probability that the median decision-maker is convinced when he does not fulfill the communication constraint and the lobbied decision-maker has a lower bias than the adviser, i.e., $p_i < a$. In that case the probability that X_i' is sent is diminished, but its informational content is larger. As a result, there arises a different communication constraint, which is now $\frac{1}{2}(p_i - h)$ instead of $\frac{1}{2}(a - h) \equiv \underline{a}$.We show that the adviser has a clear pecking order when it comes to whom to lobby.

[12]Unlike in Caillaud and Tirole (2007), preferences are always nested, and those with higher probabilities of implementing by default will be convinced by those with lower probabilities.

Proposition 3. *The adviser prefers to (1) not lobby anyone, (2) lobby the member with the most congruent preference, (3) lobby the median decision-maker. She prefers* (1) > (2) > (3)*, and only chooses option* (2) *or* (3) *when higher ranked options do not lead to implementation of the project, as long as the report's cost is sufficently low.*

We analyze why this proposition holds in a situation where the median decision-maker has to be convinced of voting $X_i = 1$. Assuming that $p_1 < p_2 < 0 < p_3$, so that by default a project is not implemented, and also assuming that the upper bound of the communication constraint is always fulfilled, the adviser's utility is determined by a range of factors. Firstly, it is not necessary to worry about the fact that the project is implemented even though $\mu < -a$, as all decision-makers follow a negative recommendation. The only source of value for the adviser is the fact that potentially a project gets implemented. By sending the report to P_3, A may reduce the probability that the project is implemented, namely because it has to be true that $\mu \geq -p_3$, rather than $\mu \geq -a$. If $p_3 < a$, then it reduces the probability in one way, but in another way, it can increase the probability that $X_i = 1$ is chosen by the majority, as the communication constraint is increased, so that a larger range of p_i can be convinced. First, as a benchmark, it is necessary to identify the adviser's utility in case she merely sends a cheap-talk message:

$$U_A(\text{recommendation}) = \begin{cases} 0 & \text{if } p_2 < \underline{a} \\ \frac{1}{2h}(h+a)(a+\frac{h-a}{2}) & \text{if } p_2 > \underline{a}. \end{cases} \tag{18}$$

Merely sending a recommendation is only valuable if A sends $m = m^g$ and if P_2 does not have a too negative predisposition toward X. Another option is to send a report to P_3. The adviser then gets the following pay-off, which depends on the level of internal congruence between P_3 and P_2. In equation (19) it is already taken into account that A only sends a report when it can convince the decision-maker that reads the report. Also, when $p_2 < \frac{1}{2}(p_3 - h)$, A ends up sending no report to P_3 at all, hence $U_A = 0$.

$$U_A(\text{report to } P_3) = \begin{cases} 0 & \text{if } p_2 < \frac{1}{2}(p_3 - h) \\ \frac{1}{2h}(h+p_3)(a+\frac{h-p_3}{2} - c_s) & \text{if } p_2 > \frac{1}{2}(p_3 - h) \end{cases} \tag{19}$$

Clearly, there is a benefit of sending a report to P_3 when $p_2 \in [\frac{1}{2}(p_3 - h), \underline{a}]$, as then the adviser is not able to convince the median decision-maker, while another decision-maker (P_3) is able to, when his bias is weaker than the adviser's. Moreover, from the above equations it becomes clear that whenever A is already able to convince

a majority with a cheap-talk message, she doesn't benefit from sending a report to P_3. This is caused by the fact that by sending the report, A also delegates informal authority to P_3, and whenever their preferences are not perfectly congruent, A incurs a cost of doing so, besides the cost of the report itself. However, when only P_3 is able to convince P_2, there arises a potential benefit, provided that the cost of the report is not too large.

This doesn't mean that it is optimal to lobby P_3; it could also be possible that it is in A's best interest to lobby P_2 directly. As there is perfect internal certainty, whenever P_2 is convinced, P_3 is also convinced. When P_2 still states voting intention $X_2' = 0$ though, it may be the case that P_3 follows P_2's negative recommendation. This however irrelevant, as only P_2's vote is vital, and he votes $X_2 = 1$ as long as $\mu \geq -p_2$. The adviser's utility from sending the report to P_2 is simply:

$$U_A(\text{report to } P_2) = \frac{1}{2h}(h + p_2)(a + \frac{h - p_2}{2} - c_s). \tag{20}$$

Finally, it has become clear, that in the particular case of $p_1 < p_2 < 0 < p_3$, the selection of the decision-maker by the adviser depends crucially on the preferences of the median decision-maker. In the most optimal situation from the adviser's perspective, the adviser doesn't need to send a report, and a majority is convinced anyway. The second best case is when A sends a report to P_3, who subsequently convinces P_2 of voting $X_2 = 0$. Only in some cases is it optimal to directly send the report to P_2, namely when $p_2 < min(\frac{1}{2}(p_3 - h), \underline{a})$. Also, although they are not treated formally, it becomes clear that there is no extra benefit from sending both P_2 and P_3 a report, as there is internal certainty.[13] Secondly, it is never optimal to lobby P_1, as it is hardest to convince this decision-maker, while there is no extra benefit from sending the report to him in comparison with sending it to P_2. Also, it should be noted that there is no equilibrium in which A chooses a decision-maker as a function of μ, as then voters know that a project should not be implemented whenever they don't get a report.

Advisers therefore don't always benefit from sending a report, and they also do not always lobby the median decision-maker, even when there is internal certainty. By lobbying decision-makers to the 'right' of the median voter (decision-makers that have preference between the adviser's and the median voter's preference), it is still possible to convince the median voter, even though he hasn't read the report himself. This depends crucially on internal congruence, as when preferences become too incongruent, the median voter doesn't benefit from following advice from his peer.

[13]The lobbyist makes a different trade-off when there is no internal certainty.

4.5 The Adviser's Benefit of Internal Certainty

Although it may seem intuitive that advisers always benefit from internal certainty, this is not always the case. This however crucially depends on the composition of the group. Recall that the beliefs about $E[p_i|\text{uncertainty}] = 0$ is that the decision-maker is perfectly moderate. To ease our analysis, we assume that $a = h$, and only one member can receive a report. A report is necessary to convince members with negative biases. We also assume for simplicity that there exists external certainty but internal uncertainty. Two cases are elaborated to show that the value of internal certainty is ambiguous.[14]

Case 1: $p_1 < \frac{1}{2}(p_3 - h) < p_2 < -\frac{h}{2} < p_3 < 0$
In the first case, there exists a majority against the project. In equilibrium, without internal certainty, it must be true that the median decision-maker receives a report. This holds, as the positive recommendation of P_3 under internal uncertainty is not sufficiently strong. As P_2's vote is vital in implementing the project, the adviser must send the report directly to the median decision-maker. Although the adviser can ensure that P_3 votes $X_3 = 1$ whenever $\mu \geq p_3$, his voting intention leads to the belief that $E[\mu|X_3' = 1] = \frac{h}{2}$, while the correct belief is that $E[\mu|X_3' = 1] = \frac{h-p_3}{2}$. Due to our assumption of the value of p_2, the median decision-maker would be convinced when there would be internal certainty, but due to uncertainty status quo is retained. This is clearly costly for the adviser, and because P_2 has to be lobbied directly instead of indirectly and the project is implemented less often.

Case 2: $p_1 < -\frac{h}{2} < p_2 < \frac{1}{2}(p_3 - h) < 0 < p_3$
Although the first case shows that internal certainty is to be preferred by the lobbyist, this does not mean that this is always true. In the second case, when the adviser would send a report to P_3, his positive recommendation is stronger under uncertainty, as $\frac{h}{2} > \frac{h-p_3}{2}$. In this specific case, contrary to the first case, internal *certainty* would now mean that the median decision-maker has to be lobbied directly. Again, the lobbyist would still benefit from sending a report, but this benefit is weaker in comparison with sending a report to P_3 under internal uncertainty. Without internal certainty, P_3's positive voting intention is sufficient to sway the vote of the median decision-maker, which means that the project gets implemented more often, namely whenever $\mu \geq -p_3$ instead of $\mu \geq -p_2$.

[14] Clearly there are an infinite number of other cases imaginable, but examining them all is unnecessary, as our only goal is to show that internal certainty is not always beneficial for the adviser.

4.6 Experts and Political Parties

A decision-making group often subsists of sub-groups of members with congruent preferences. In parliaments, these sub-groups are political parties. In every party, there is often an expert who has the most knowledge regarding a particular policy domain. Other members of the party tend to listen to this expert, given that their preferences are sufficiently congruent. Having an expert in the group also affects the lobbyist's selection of a decision-maker, and her willingness to send a detailed report. One can imagine that if there is an expert who always knows what's best and faces no uncertainty, that there is no reason to attempt to change his beliefs. For this reason we assume in our model that there is a positive probability $0 < \beta < 1$ that the expert observes μ. We expect to find that there are two main effects of β, one which induces more reports, while the other reduces the incentives for the adviser to send reports. On the one hand, having an expert may make it less necessary to send a report about μ, but on the other hand, the expert himself may have very different preferences than other members, which may necessitate lobbying attempts of the lobbyist. We first review a case in which the expert is the sole decision-maker.

4.6.1 The Expert Dictator

If the expert is the only decision-maker, then his expertise reduces the scope of hard information transmission between the adviser and the decision-maker.

Proposition 4. *In a situation with one decision-maker and one adviser, an increase in the expert's probability that he has information leads to a decrease of reports.*

Proof. This proposition is relatively simple to prove. Whenever decision-maker P_i observes μ himself, he simply ignores all messages from the adviser, and chooses $X_i = 1$ if $\mu \geq -p$. If not, then he listens to the adviser's recommendation if he fulfills the communication constraint, or chooses $X_i = 1$ upon reading a report if $\mu \geq -p$. We first assume that the adviser observes p_i as well. From the perspective of the adviser, she can choose two options. The first one is to never send a report, which lead to the following pay-offs:

$$U_A(\text{cheap talk}) = \begin{cases} \beta(\frac{1}{2h}(h+p))(a+\frac{1}{2}(h-p)) & \text{if } p_i < \underline{a} \\ \beta(\frac{1}{2h}(h+p))(a+\frac{1}{2}(h-p)) + (1-\beta)(a+\frac{1}{2}(h-a)) & \text{if } \underline{a} < p_i < \bar{a} \\ \beta(\frac{1}{2h}(h+p))(a+\frac{1}{2}(h-p)) + (1-\beta)a & \text{if } p_i > \bar{a} \end{cases} \tag{21}$$

Sending a report may provide value if it can convince the expert to vote otherwise.

This happens with probability $(1-\beta)$, and then P_i does not observe μ. As the adviser in this case knows p_i, she knows in advance whether it could be worthwhile to send the report. Consider a case in which $p_i < \underline{a}$, and $\mu \geq -a$. Then $m = m^g$ does not convince P_i to choose $X_i = 1$. A report convinces P_i whenever $\mu \geq -p_i$, but is unnecessary with probability β and is written when:

$$c_s < (1-\beta)(\frac{1}{2h}(h+p_i))(a+\frac{1}{2}(h-p_i)) \tag{22}$$

An increase in β leads to a decrease in the RHS. Logically, the adviser is willing to spend less resources on reports when the expertise of the decision-maker is increased. This is also true when the decision-maker does fulfill the communication constraint, and also when $p_i > \bar{a}$. In the latter case, the argumentation is merely the complete opposite, as then the adviser wants to convince the expert to not implement the project when it shouldn't be implemented.

Moreover, the expert may wish to withhold information about his preferences with the adviser as well. However, as there is now a probability β that lobbying is futile, the adviser is less willing to send a report by default. The same arguments as in section (4.1) apply here, and especially those decision-makers with preferences that are not within the communication constraint have the biggest incentives to reveal their preference.

4.6.2 The Expert in a Group: Information Diffusion

In a situation in which the expert is not the sole decision-maker, he needs to convince at least one other decision-maker as well. His ability to do so depends on his own preference, as his voting intentions contain more information once his bias is not too strong (neither too negative, nor too positive). Especially in cases when experts have strong preferences, external advisers can help in increasing the scope for information transmission when their preference is less strong or opposite to the expert's predisposition.

In a situation where there is internal certainty about preferences, the voting intention of the expert only carries information content when he has observed μ. Other decision-makers however don't know whether the expert actually has an informational advantage over them, while they are certain that the adviser has. As a result, the adviser still has an additional benefit for the group. To show the adviser's value in the presence of an expert, we assume that the majority is initially predisposed against the project, but the expert P_3 is positively predisposed toward implementing the project. More specifically, the assumption is that: $-h < p_1 < p_2 < 0 < p_3 < a < \bar{a} < h$.

As a rule, every decision-maker only listens to the message which carries more

informational content. If P_3 would be equally knowledgeable as A, then it follows that if both would send a cheap talk message to P_1 and P_2, that they would follow P_3's recommendation if he tells them $X_3^{'} = 1$ and follow A's recommendation of $m = m^b$. If recommendations were conflicted, other decision-makers calculate the expected value of μ based on the fact that it must be in the region in which the adviser and expert would disagree (i.e. $E[\mu] = -\frac{1}{2}(a + p_3)$). Assuming that we are in a situation of $\mu \geq -a$, positive recommendations from both the expert and the adviser carry equal informational content if:

$$\frac{\beta}{2}(h - p_3) = \frac{1}{2}(h - a) \iff \widetilde{\beta} = \frac{h - a}{h - p_3} \tag{23}$$

An increase in β makes the adviser's recommendation more and more useless, unless she sends a report.

Now the questions remains, who should receive a report? This crucially depends on how congruent the preferences are of the adviser and the expert. Clearly, if preferences are perfectly congruent, the only benefit of sending a report to this expert stems from the fact that his level of expertise is increased. However, whenever the adviser wants that the project is implemented, the expert agrees, so that sending the report to him is without any value. It is therefore necessary that congruence is imperfect. In that case, the adviser and expert sometimes disagree about whether the project should be implemented. Then the message space is increased from two to three subsets, which is beneficial for other members as they more precisely learn the state of the world.

4.7 Summary

We have formally derived the effect of internal and external uncertainty on the mode of communication and on the probability that the project is implemented. By giving members of a decision-making group the power of sharing information about their bias before they learn more about the project at hand, they influence two important factors. The first effect is on the mode of communication. By sharing information about preferences with the adviser, she learns whether it's worthwhile to lobby at all, or whether to go to a different lobbyist. The more congruent preferences are, the less incentives the lobbyist has to send a detailed report.[15] Hence, if decision-makers prefer to read a report instead of only hearing the adviser's recommendation, they will send information about their preferences as a function of the level of congruence.

[15] In contrast with Caillaud and Tirole, there is an actual cost of sending the report, instead of the potential cost that a member takes a 'bad' decision (from the adviser's perspective) only after reading the report.

Interestingly, they also know that there is a positive externality of letting the adviser know that they do not need a report when they are already sufficiently convinced, as then the probability that other members are convinced is increased.

The second effect is on internal communication between members. When decision-makers only know their own bias, but not those of their peers, they gain less precise information after viewing a lobbied member's voting intention. Members therefore benefit from knowing the predisposition of other member's precisely, as they then update their beliefs about the state of the world in a better way. It is however not always in a member's self-interest to share this information. Especially members with extreme preference benefit from keeping other members in the dark, as there is a larger scope for persuasion in that case.

5 Discussion

This model is not without practical implications. It is not always true that lobbyists and politicians have complete information about each others' preferences. Especially after elections, with an influx of new members in a group, external certainty is low, and internal certainty is only high within political parties. If members do not have a history in a group, there is no way to determine what their priors are for any given issue. In game theory it generally holds that having more information is better; this explains the value of decreasing external certainty. It can be extremely beneficial for firms such as Philip Morris to spend resources to reduce this uncertainty, so that they make the correct decision with respect to whom to lobby and how much effort to exert.

However, in our model the spread of information about preferences is determined by the actions of decision-makers. Their strategies are motivated by wanting to affect the mode of communication, and by wanting to affect their peers' beliefs about the informational content of their recommendation. Clearly, from the perspective of the group as a whole, complete internal certainty is to be preferred, but it is not always optimal for individual decision-makers. Although it seems to be counter intuitive, internal certainty is not always preferred by the lobbyist either. The reason is that the recommendations of extreme members do not have a lot of value if they reveal their preferences to the other members.

Another important implication of our model is related to political parties. They have a profound influence on the mode of communication. Especially in a repeated setting in combination with having a political party, members can coordinate on an equilibrium in which all members have complete certainty about each others' preferences. By forming political parties, members therefore also affect the number of

reports that are sent by the lobbyists, and who get these reports. Being a member of a political party is both a signal of political preferences, of congruence with other party members, and of internal certainty within a party. As a result, lobbyists will often target political parties instead of separate members, and will prefer communication with bigger political parties than smaller ones. The reason is that advisers know that by convincing one member of a political party, other members of the same party are extremely likely to be convinced as well as information cascading is more probable. Hence, even without external certainty, political parties can be valuable signals, and invitations for lobbyists to send hard information to members of these parties.

There is also a benefit from having an expert member inside the group. Although the expert must exert costly effort to get more information autonomously, there is a clear benefit for the group. First of all, if there is incongruence between the group's preferences and the adviser's predisposition, the expert's recommendation is more valuable, as the group has more precise information about the state of the world. It may also force the adviser to send hard information. This explains the phenomenon that parties indeed have experts on each policy issue. Especially when lobbyists have a bad image, telling other members that you have been persuaded by a lobbyist does not always mean that your recommendation contains any additional information. Upon observing an unexpected voting intention, it may also mean that a member was bribed by the lobbyist. Having an expert may serve as a check to reduce the scope for bribery, and reduce the scope of false information.

Our model also explains why politicians go to the media. By participating in talk-shows and social media, they can easily publicly communicate about their preferences and about how much information they have. Naturally there are many other reasons to go to the media, such as electoral and personal benefits, but there is also an effect on the mode of communication, as lobbyists may learn that it is necessary to lobby, and may also learn that sending hard information is preferable over giving a mere recommendation.

6 Conclusion

In persuading a group, both internal and external certainty is crucial in determining the mode of communication and the chance of success. Lobbyists both care about the implementation of a project and about the lobbying costs. For these lobbyists, there is a clear pecking order of outcomes. Given that the project can potentially be implemented, lobbyists prefer to keep informal authority in their own hands. This means that they would prefer that the project is implemented whenever that is in their own best interest. If the lobbyist's recommendation does not contain sufficient

information, it becomes necessary to write reports with hard, verifiable information. In the end, the only thing that matters is whether the median voter is convinced, but that does not mean that he has to receive a report. It is also possible that this median decision-maker is convinced by the recommendation of one of his peers. Normally, those recommendations have no informational weight, but once they can credibly signal that they received information from a lobbyist, then their recommendations can sway the votes of the median decision-maker, provided that congruence between those two decision-makers is sufficiently large. If congruence is insufficient, then the only remaining option is to send the report directly to the median decision-maker.

The choice of decision-makers to transmit information about their preference crucially determines the mode of communication and potentially the informational content of their voting intentions if they have received a report. Given that the adviser's predisposition is common knowledge, it is known when she has an incentive to send a report. As a result, some decision-makers would want to signal that they need a report, so that they have a clear incentive to increase external certainty. However, once they received the report, they want that their voting intentions have a lot of weight, and members with extreme preferences would want to appear more moderate than they actually are. As a result, in some cases internal certainty does not arise.

Experts also have a significant influence on the mode of communication. On the one hand, their expertise inhibits the adviser's incentives to provide hard information, as this expert already has this information. However, when the predispositions of the expert and adviser differ sufficiently, the adviser's recommendation has additional value, and when she sends a report to a decision-maker who is not an expert, the message space is even increased to a higher number of partitions. From the perspective of the group as a whole, this is of course beneficial, but individual members obviously benefit most if the project is only implemented if it is in their best interest.

Extensions

There are still many possible extensions to this research field, but due to time and space considerations it is not possible to formally treat them. In this final part, we mention extensions that we think are relevant and we hypothesize what would happen if our model would be changed in certain aspects.

One of the most important extension is placing our game in a repeated setting. This opens up a whole range of possible considerations. First, it creates the possibility that strategies can be made conditional on past behavior. For example, lobbyists can threaten to only provide hard information if they receive information about preferences. In our thesis we have found that in most cases internal and external certainty

do not arise (at least not completely) so that socially desirable behavior can be induced by repeating the game. Moreover, it also opens the way for logrolling. If members can trade votes, then we expect that issue-relevant information becomes less important in determining whether decision-makers want that a project is implemented. If members engage in the trade of votes, then they agree to vote against their own preference in the short run in return for the peer's vote in the future. These types of incomplete contracts can arise both in and between political parties. An important negative result is however that the adviser's inclination to send hard information is reduced as the probability that members can be convinced is reduced.

Another extension is especially relevant in countries that allow for whips. A whip is an institutionalized member who collects information about preferences, allows for logrolling, and pushes members to attend votes. When this whip is paid by the group, he can be contractually obligated to collect and spread information about preferences in order to increase both internal and external certainty. However, there is a trade-off, as in the repeated game, the whip increases the potential for logrolling.

In addition, allowing for more sequential communication also increases the scope for information cascades, even when the informational base is low. When members get multiple chances to give recommendations information can cascade from members who are weakly opposed to those who are strongly opposed to a certain policy. This weakens the earlier mentioned communication constraint, and lobbyists can subsequently increase the probability that the project is eventually implemented.

Finally, it is also extremely relevant to examine what happens if groups have multiple layers. In this thesis it is assumed that there is merely a single layer. When there are multiple layers, then higher layers can let lower layers function as information portals. If members in higher layers restrict communication between them and the lobbyist, the lobbyist's action space is reduced to doing nothing or persuading the lower layer. If both layers need to be convinced, the composition of the lower layer becomes a strategic tool to influence the mode of communication. A relevant trade-off arises, as on the one hand, higher layers prefer congruence with lower layers, as then their recommendations is completely in line with what is best for members in the higher layer.[16] On the other hand, it is also valuable to let members of lower layers have extreme and opposite preferences, in order to increase the probability that members in the lower layer receive a report. Otherwise, the recommendation of the lower layer carries no informational value.

[16]This is known as the ally principle (Swank, forthcoming), where decision-makers prefer advisers with equal preferences.

7 List of References

Caillaud, Bernard and Jean Tirole (2007). Consensus Building: How to Persuade a Group. *The American Economic Review* 97 (5), 1877 - 1900.

Dewatripont, Mathias and Jean Tirole (2005). Modes of Communication. *Journal of Political Economy* 113 (6), 1217 - 1238.

Swank, Otto H. (forthcoming). Advice. *Working Paper*, 1 - 20.