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What Can Be Learned from a Biased Expert

CHEAP TALK

In Economics we pay attention to actions. When we seek to discover what people want, we look to the choices that they make. This idea is called revealed preference, an old and very powerful constituent of the profession's core beliefs. It means, simply, that when a person does something, that action is the best among all actions available at the time of the choice. A man with excessive credit card debt may prattle on about how much he values fiscal responsibility, but his unpaid balances belie his words. A woman with an overflowing shoe closet claims to place her children first, but, evidently, they lie somewhat further down the list of priorities. It is the choices, not the words, that make clear the true values.

Along with the trust in actions comes a disdain for talk. The term is "cheap talk." Job seekers dress up for interviews, hoping to give the impression of maturity and seriousness. But the immature and the frivolous, too, can don a nice suit. The dress-up is cheap talk, revealing nothing. Similarly, all sellers testify to the high quality of their goods and all borrowers claim credit-worthiness. Since all can say the same words, the utterances convey no information. They are cheap talk. For a long time, economists offered little more than caution on the subject of talking and listening.

In 1982, however, Crawford and Sobel opened our eyes to the possibilities of studying cheap talk. They looked at the case of an uninformed principal seeking advice from an informed agent. For example, a politician asks a tax expert for recommendations about how to deal with a tax shelter. The expert has her own opinions about tax policy, and those opinions may colour her advice. How is the politician to interpret what she says? Similarly, an investor consults an investment advisor, who may be rewarded with bonuses for marketing particular stock funds. How can the investor sort out the good information from the self-interested recommendations? There are obviously many similar cases in the economy, where a decision-maker needs advice from a knowledgeable but biased expert.

THE GOVERNOR AND THE HOSPITAL ADVISOR

Consider the following example. In the summer of 2003 Detroit Medical Center, the city's only level-one trauma treatment center threatened to close or relocate most of its operations. A series of unplanned events and missteps led to a fiscal crisis. The Governor of Michigan, convened a meeting of political leaders in the area to develop a plan for how to proceed. They decided on a one-time bailout that would provide the hospital with funds during a period of restructuring. Not an expert in the economics of health care, the governor needed advice about the size of the bailout.

Let's consider the strategic problems that she faced from the perspective of the principal-agent model. The governor – the principal – needs advice, and a few experts – the agent, or agents – stand ready to give it. These potential advisors know the true situation at the hospital. Each can see through the accounting and form an accurate assessment of the needed payment. Here lies the fundamental information problem. The agents know the true needs of the hospital. The principal does not. The principal will, of course, have some conjecture about the amount of funding needed. Let us say that the Governor knows only that the needed funding lies between $0 and $100 million, and that with no other information she considers the possibilities to be equally likely.

If the governor knew of an advisors who shared her values (that is, if he had a bias of zero), then there would be no difficulty. She could simply ask for the information and trust the self-interest of the advisor to bring about honest reporting. Confident that the governor would act on his advice, the advisor would rationally choose to tell the truth. All relevant information would be truthfully transmitted to the principal, and the outcome would be best from both points of view.

In this case under discussion here, however, there is a particular difficulty: each of the potential advisors has a bias of one sort or another. One long-time advocate for greater funding of urban health care would like to see a payment sufficient to keep the hospital solvent plus an extra $10 million for the backlog of deferred maintenance repairs. Another critic of city finances believes that there is $20 million in waste that will only be eliminated when the management faces a budget shortfall. The former advisor has a bias of plus $10 million; the latter, minus $20 million. These biases form the conflict of interest that sets the principal and agents in opposition.

Picture the Governor on a football field. The plus \$10 million expert stands 10 yards downfield. Any advice that he gives will be suspect. The governor knows that he will attempt to pull her in his direction closer to his preferred outcome. The minus \$20 million expert waits 20 yards behind her and will presumably offer opinions designed to promote his agenda of lower funding. Others loiter about the field to one side or the other, each with valuable knowledge, but none without bias. In such an arena, whom should the principal ask for advice? How many opinions should she seek? And how can she interpret the babble of advice?

The governor cannot delegate the responsibility for making the decision. She is the elected representative, and the advisor is merely a private citizen. The hopes for a good outcome, for giving the needed amount (and no more) to the hospital, rest on her ability to learn from communicating with the advisors. She is free to set the procedure for the giving of advice. She may ask for any information. She may even ask one advisor to evaluate the advice given by another and call for rebuttal. She may require a sequence of reports. She may keep the advisors separate or bring them together. Whatever procedure she designs, however, will come up against the inherent conflict of interest between her and her biased advisors.

We also stipulate that there is no way for the governor to give a private financial incentive for truthful advice. In other words, she cannot write a contract the promises to pay a large amount for truthful advice and nothing for advice that turns out to be false. The advisor can always claim to have done his best to discover and accurately reveal what he has learned. There is no way to distinguish, after the fact, deception and error. According to the lingo of principal-agent theory, the advisor's information is non-contractible.

Because the value of the advice will lie in her ability to use it to make a better funding decision, we must first understand her best tactic with no advice. Then we can compare the gains from various schemes that she might try. With only her own conjectures to rely on, the best that she can do is to split the difference between the highest and lowest of the equally likely possibilities. Thus, she chooses to give \$50 million. If the needed amount turns out to be \$100,000, her bail out will fall short by \$50 million. If nothing is needed, then she will overpay by \$50 million. On average, however, her error will be \$25 million, and that is that minimum average error unless she can find a way to extract some information from her biased expert advisors.

An unsophisticated principal might simply ask the advisor with the \$10 million bias to reveal the needed payment. Expecting that this advisor would inflate his estimate by \$10 million, the governor would plan to subtract \$10 million from the response. This works with a foolish expert, but not with a wise one.

The wise expert anticipates the governor's subtraction and adds $20 million to his estimate. The one-step smarter governor anticipates this anticipates and subtracts $20 million. But the one-step smarter advisor inflates his number by $30 million; and so it goes. This kind of approach can only succeed if the principal knows that she is one step more sophisticated than her advisor, but in general it does not give a firm foundation for policy. Such a conversation between sophisticated interlocutors leads to what researchers in this field call the babbling outcome. Words are spoken and heard, but no information is transferred. Unable to learn anything the governor is back where she started and can do no better than offer the $50 million.

This outcome is obviously wasteful. Even though the knowledge exists to exactly match the transfer to the need, the wrong amount is almost always spent. Sometimes too high, sometimes too low, the transfer has an average error of $25 million. This displeases not only the governor but also the advisor. From his perspective, the problem is that he cannot credibly claim that his information is correct. Even if he were willing to put aside his own bias and tell the truth to the governor, she would not believe him. Both remain stuck in an uncommunicative relationship babbling back and forth.

TALKING TO A BIASED EXPERT

While simply asking for the number fails, there does exist a more sophisticated strategy that can improve the communication. The key insight lies in asking for less and getting more. (This is a principle that many of us have learned from romantic relationships.). Here is how it works. The governor consults an agent, say the one with the plus $10 million bias, asks the following question: Is the needed amount more or less than 30 million? The governor does not ask for the exact amount; rather, she asks for something less. Ironically, asking for the exact amount only brings about babbling. Asking for less precise information, on the other hand, will result in more communication.

Before we look at where this number comes from, let us see how this particular question works in fostering communication and what it gains. Recall that the advisor knows the true amount. Whether he will truthfully answer whether that amount is more or less than $30 million depends on what he thinks that the governor will do with the information. So the first step is to put ourselves in the shoes of the governor and see what she will do. Of course, there is also the question of whether she believes the advisor, but we will get to that. While this seems hopelessly complicated, it can be reasoned through in a step-by-step manner. We do this by first supposing that she believes the answer, and then determining her actions and working backwards to check that telling the truth is in the best interest of the advisor.

What will she do if he answers, “It’s less than $30 million”? The lowest average error is always found by splitting the difference; so she will pay $15 million to the hospital. If, on the other hand, the advisor says that the need is greater than $30 million, then she chooses $65 million (half-way between $30 and $100).

Returning to the advisor, we see that, essentially, he has a choice of two outcomes: $15 million, if he answers, “less”; and $65 million, if he answers, “more.” If the truth is less than $30 million, then he desires a subsidy of less than $40 million ($30 million plus his bias of $10 million). In this case, the closer of the two outcomes is $15, which requires a response of “less.” If the truth is more than $30, he prefers a subsidy of more than $40. The closer outcome is $65, and he selects “more.” In each case, he tells the truth. Economists say that there is an equilibrium: each party is making the best choice, given the choices of the other. (This idea is what Russel Crowe was trying to explain in the bar in the movie, “A Beautiful Mind”).

The average error is now considerably less than the $25 million in the babbling outcome. (In fact, it is $16.75). What causes the improvement is her ability to match more accurately the subsidy with the need. Hearing “less,” she can limit the bail out to $15 million, not having to worry that the needed amount may exceed $30 million. If he answers, “more,” she can put out of her mind any thought that only a small payment is required. Admittedly, her information is quite limited, but nonetheless, it does allow matters to improve. We draw the first lesson concerning how to learn from a biased advisor: Ask for less. Specifically, rather than asking for exactly what the biased advisor knows, limit the query to a question of “more than or less than”.

This procedure induces the advisor to tell the truth by asking for no more than is in his interest to reveal. Valuable information is communicated, although the whole truth is not. When this scheme is used, the agent knowing the exact amount communicates an approximation to the principal, who knows only whether the true amount is less or greater than $30 million. The information that potentially could be communicated is made less precise; or in the lingo, it undergoes a coarsening. Very much the same thing happens when one attempts to interpret an utterance in a foreign language studied in high school. “J’ai mal a la jambe” is heard as, “He has an ache somewhere”.

This happens to be the best, most informative outcome. The principal can only divide the possible outcomes into two parts. More partitions mean more information is transmitted. The natural question to ask is what limits the number of partitions. The answer is given in Table one. For a bias of $25 million or more, it is impossible to divide the possible outcomes. When the bias lies between $8,333 and $25 million, there can be two partitions, etc. The table also gives formulas for where to make the cuts. (Recall that the best action always splits the difference between the highest and lowest numbers in each partition.).

Table One

Bias	# of Partitions	Range (millions)
>$25 million	1	($0, $100)
$8,333 – $25	2	($0, $50 – 2 b, $100)
$4,167 – $8,333	3	($0, $33.3 – 4 b, $66.7 – 4 b,1)
$2,500 – $4,167	4	($0, $25 – 12 b, $50 – 8 b, $75 – 8 b, $100)

In the third column b denotes the bias in millions.

It might seem that to learn to most possible from a two-partition question, one would set the cut-off at $50 million. Such a cut-off is like a dam with a leak, however. Let us try it and see. The principal asks, "Is the needed payment more of less than $50 million?" The advisors says, "If I say less and she believes me, she will pay $25 million. If I say more, she will pay $75 million." Suppose that the true amount is $45 million. The advisor prefers $55 million, but that figure lies closer to $75. The crafty advisor lies and answers, "more." A sophisticated principal anticipates this dissembling, but the advisor anticipates her anticipation and the entire conversation breaks down into a welter of deception. Recall that the revelation principle tells us that we can always achieve the best outcome by constructing a scheme that induces the agent to respond truthfully. The 50–50 split fails the test of truthfulness.

Suppose that our principal instead were to choose another, more biased expert, say the one twenty yards further ahead on the field. From the table we see that with a bias of $20 million the best possible partition has only two divisions, and that the cut takes place at $10 million ($50 – 2 x $20 = $10). For less that $10 million the governor's payout is $5 million and for more it is $55 million. While there are two partitions with each expert, the information contest of this partition falls short of that available when the expert had only a $10 million bias. Here the expected error jumps up to $21 million, significantly worse than in the first case. The outcome worsens because the split is less symmetric. Dividing the information pie in two halves gives the most information, but it is not feasible. A greater bias drives the division further from two equal halves and thus reduces the potential learning. This insight gives us our second lesson, which is that the principal should choose the least biased expert.

A SECOND OPINION?

Most health experts advise seeking a second opinion for any significant diagnosis. Can our governor learn more by consulting a second expert? The answer depends on two factors. First, does the second expert know about the advice given by the first? Also, is the second expert biased in the same direction as the first? If the answer to the first question is yes, then there is something to be gained from a second opinion. The argument is rather simple.

We saw that with an expert of $10 million bias, the principal can get a truthful answer to the question, "Is it more or less than $30 million." Using similar logic we can determine that the second biased expert (with the $20 million bias) will tell her if it is more or less than $10 million. The two of them taken together effectively divide the possibilities into three parts: less than $10 million; between $10 and $30 million; and more than $30 million. Again, more parts mean better information, allowing better decisions. Our third lesson is therefore to seek additional advice when the advisors know nothing of each other or of their advice.

If the advisors do know about each other, however, they will foil this scheme. The second advisor will not cooperate. Knowing that the information will only be used against him, he anticipates the above scheme and dissembles. While he can affect the overall amount of learning by the principal, the second advisor will never participate in a process that leads to less spending than would occur with only the first advisor's participation. The only possible result of his manipulation is to increase spending in his direction. Since the situation with one advisor already results in too much spending (on average $16.75 above what is needed), the wise principal never asks for a second opinion in this case.

HOW TO USE A SECOND OPINION

There is a scheme for the principal that can bring about perfectly truthful revelation by the expert (Krishna and Morgan). It depends upon finding two advisors opposite biases that are not too extreme. It works as follows. The principal asks the expert with the lesser bias for a number. Then she asks the second expert to agree or disagree. If the second expert agrees, then the principal believes the number and pays this amount. If the second expert disagrees, then he is asked for a number. Here is where we again use the principal of asking for less.

If the second expert's number is closer than twice the difference in their biases, then the principal simply refuses to listen. She labels this advice as "self-serving" and ignores it. She accepts the number offered by the first expert and follows his recommendation. Only if the second expert's number is larger by more than twice his bias does the principal hear him. Hearing such a number, the principal accepts it and pays that amount to the hospital. Amazingly, this scheme leads the first expert to tell the truth and the second one to agree.

To understand the success we let our principal choose the two experts introduced in the beginning of the chapter: one with a plus $10 million bias and one with a minus $20 million bias. The one with the smaller bias speaks first. Say that the true situation is $70 million. In this case the first expert wants $80 million (the true $70 plus his $10 million bias) and the second expert wants $50 million (the true $70 less his $20 million bias).

If the first expert tells the truth and picks $70 million, the second cannot manipulate the outcome to his advantage. The only numbers that the principal will accept are less than $30 million – that is, more than $40 million (twice his bias) lower. These numbers, however, are farther from his desired amount. He is better off agreeing with the first advisor's true answer.

The only time that the second expert can successfully improve on the number offered by the first is when the first one lies. If the first one overstates the true number, claiming, say $75 million, the second expert can respond with $35 million ($40 million less) and be believed. The $35 million number is closer to his desired $50 million. Thus the second expert will disagree whenever the first one overstates. Anticipating this response, the best that the first expert can do is tell the truth.

There is one additional complication to this scheme. In order to discipline the first advisor, the second one must have room to respond with a number lower by more than twice his bias. If the truth is less than $40 million, then the first advisor can overstate without any way for the second one to offer a number less by more than twice his bias. Obviously, he cannot claim that the truth is less than zero.

To avoid this problem, we simply ask the advisor with the positive bias to go first only if the truth is high (say, above $50 million). We let the second advisor go first if the truth is low. In other words, the principal asks the positive bias advisor, "Is the true amount greater than $50 million and if so, exactly how much is it?" The advisor with the negative bias is asked, "Is the true amount less than $50 million and if so, exactly how much is it?" Thus, the principal does not need to determine the order in advance, but rather can let it emerge endogenously from the responses of the advisors.

GETTING MORE BY ASKING FOR LESS

To sum up, we see that an uninformed principal can extract information from a biased advisor. She cannot ask a direct question for the exact truth, but rather must limit her inquiry to questions that the advisor will want to answer truthfully.

In the case of one biased advisor, the principal can only ask questions, such as, "Is it more or less than ... ?" With two advisors having opposing biases, the principal can play one off against the other and extract a truthful response.

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Czego możemy się dowiedzieć od stronniczego doradcy

Streszczenie

W rzeczywistości gospodarczej osoba podejmująca decyzje bardzo często musi opierać je na radach eksperta nie ujawniającego swych prawdziwych preferencji. W artykule przedstawiono problematykę uzyskiwania istotnych informacji od stronniczych doradców w perspektywie modelu pryncypał-agent. Omówiono schematy pytań i prawdopodobnych odpowiedzi uzyskiwanych od jednego, a następnie dwóch ekspertów przez decydenta z niepełną informacją, które mają na celu dokonanie właściwego wyboru w ramach gry toczącej się pomiędzy stronami.