The Need for Information: Mechanism Design

Authority and Abuse of Power

Can't self organize to solve all social dilemmas

Need government intervention

This requires delegation of authority

But such delegation creates new concerns

- Abuse of power
- Undue influence

Whose interests end up represented?

Sources of Power

Information

Ability to organize resources

Institutional authority

Why this Matters

Understand why we get the policies we get

How do we reform systems and institutions to improve outcomes

How do we design policies and strategies to achieve our goals within political constraints

Outline

The Need for Information

Governments often need information

- How will emissions respond to different carbon taxes?
- How much risk will banks take with deposit insurance?
- How costly is it for social media to moderate content?
- What is the herd immunity threshold?

Those with information could misrepresent and thus wield power

Key Points

Need for information is a real constraint on policymakers

They face a trade-off between

- Not implementing optimal policy
- Giving "rents" to those in possession of the information

This is true in many settings

- Regulation
- Overseeing bureaucrats
- Federalism

The Goal

We want to understand how big this problem is

We'll show you the best incentive scheme for eliciting information and using that information to make policy

This will demonstrate that governments will have to give rents to those with information

Outline

Government's Run Lots of Auctions

Spectrum for cell phone carriers

Government contracts

Oil drilling rights

Allocating a Good

Suppose the government has one good it must alloocate

N people

Person i values the good at v_i

Order people by their valuations

$$v_1 < v_2 < \ldots < v_{N-1} < v_N$$

Person i's payoff if get the good a price p is

$$v_i - p$$

The Policy Maker's Problem

Allocate good to person with highest valuation

- utilitarian optimal policy

Policy maker doesn't know individuals' valuations

Can't just fix the price and ask because everyone will lie

Second Price Auction

Auction the good

Give it to the person who bids the most

Charge the amound bid by person who bid second most

Weak Dominance

If we don't know one another's valuations, Nash Equilibrium may not be the natural solution concept

How do I anticipate your bid if I don't know your valuation?

Show it is a best response to reveal your information *regardless of what anyone else does*

Weakly dominant to tell truth

Suppose highest other bid turns out to be $b > v_i$

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It Works!

Everyone tells the truth

The good goes to the person who values it the most

Any mechanism that does this charges this price

Price winner pays does not depend on winner's valuation

Vickery-Clark-Groves (VCG) Mechanism

Second price auction is a special case of a more general idea

VCG

- Ask everyone to reveal their private information
- Implement implied utilitarian optimal policy
- Pay people their externality—i.e., their effect on sum of everyone else's value from the policy

Cheapest way to induce truth telling and utilitarian policy

What does the second price auction do?

Policy

- Give good to person who values it most (person N)

Payments

- $-v_{N-1}$ to person who gets the good
- 0 to everyone else

Second Price Auction is a VCG

Consider the person with highest valuation, v_N

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- Pay person N her effect on others: $-v_{N-1}$ (i.e., charge them v_{N-1} for the good)

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Consider a person with a valuation that isn't the highest

- With or without this person, good goes to person N and aggregate value from policy is v_N
- Don't pay this person anything

Outline

Providing a Public Good

Government deciding whether to provide a public good to two agents

Agent i values it at v_i with $0 \leq v_i \leq 100,000$

Government doesn't observe the valuations

The public good costs \$100,000 to provide

Some Examples

Bridge between two cities

Power transmission lines between two states

New school between two neighborhoods

Nuclear power plant or other NIMBY problems

Utilitarian optimum

Utilitarian payoff if provide the public good:

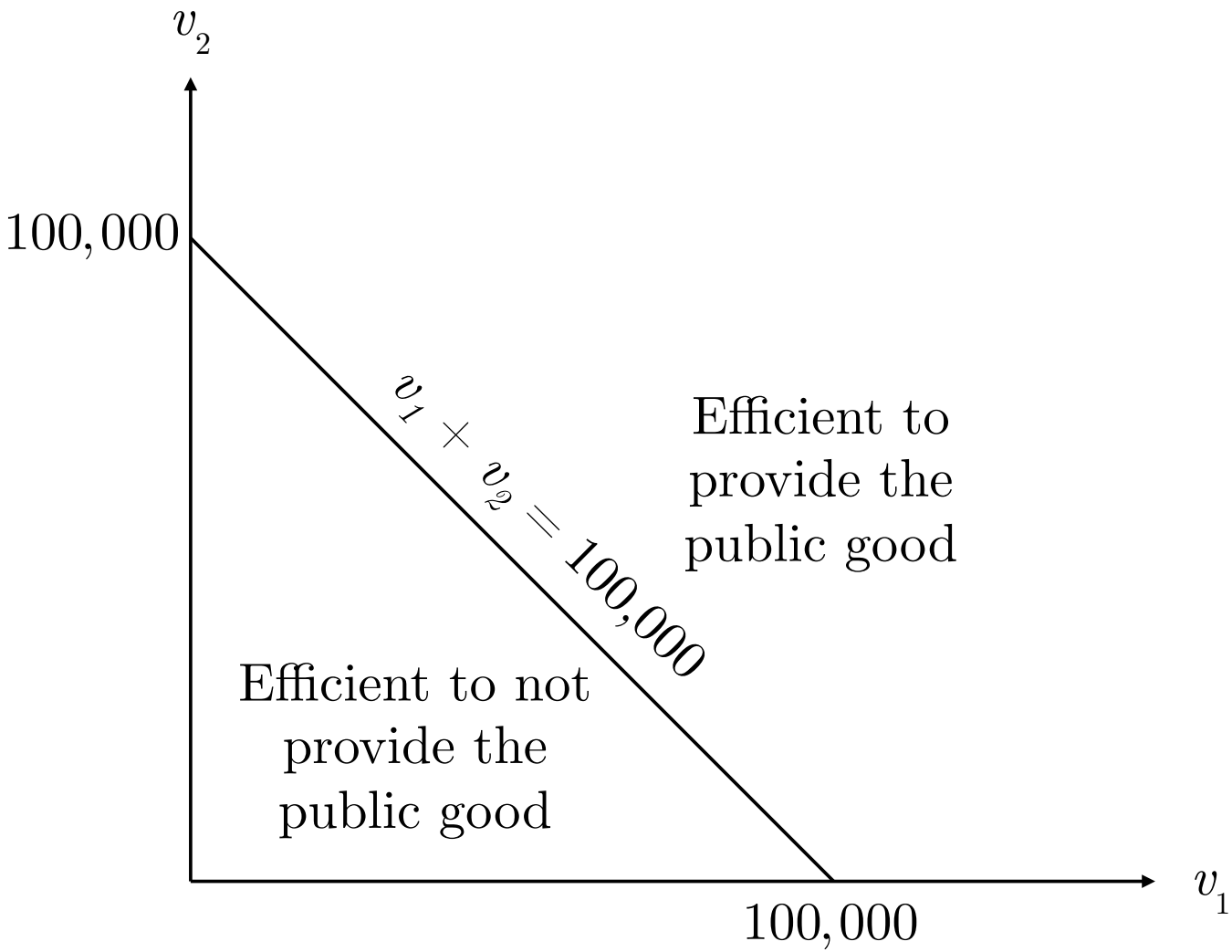
$$v_1 + v_2 - 100,000$$

Utilitarian payoff if don't provide: 0

Utilitarian optimum to provide the public good if:

$$v_1 + v_2 > 100,000$$

Utilitarian Optimum



Outline

Split the cost and reveal values

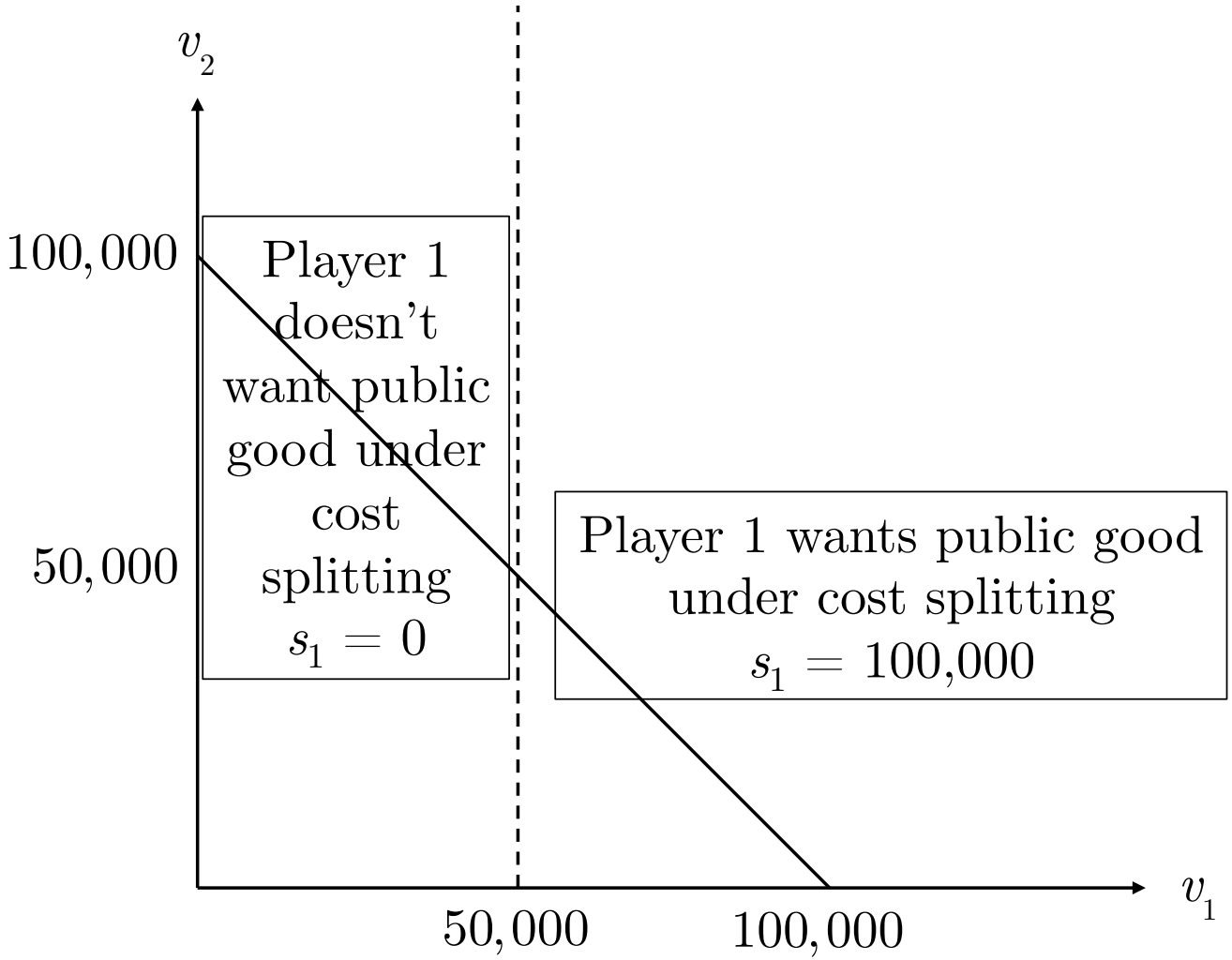
Suppose the government asks each actors their value

- Call player i's statement, s_i
- $0 \leq s_i \leq 100,000$

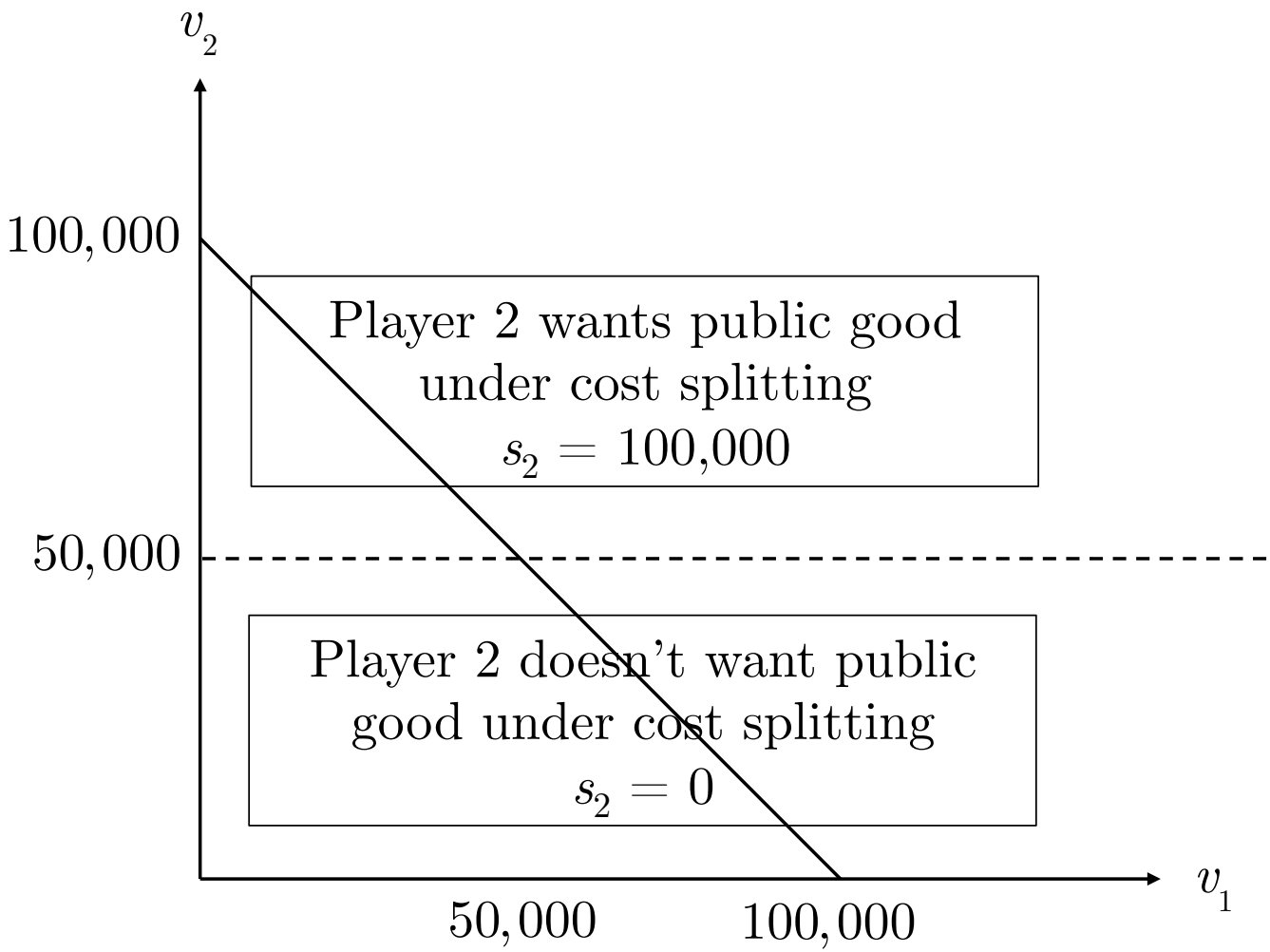
Public good provided if and only if they sum to more than \$100,000

Split the costs evenly

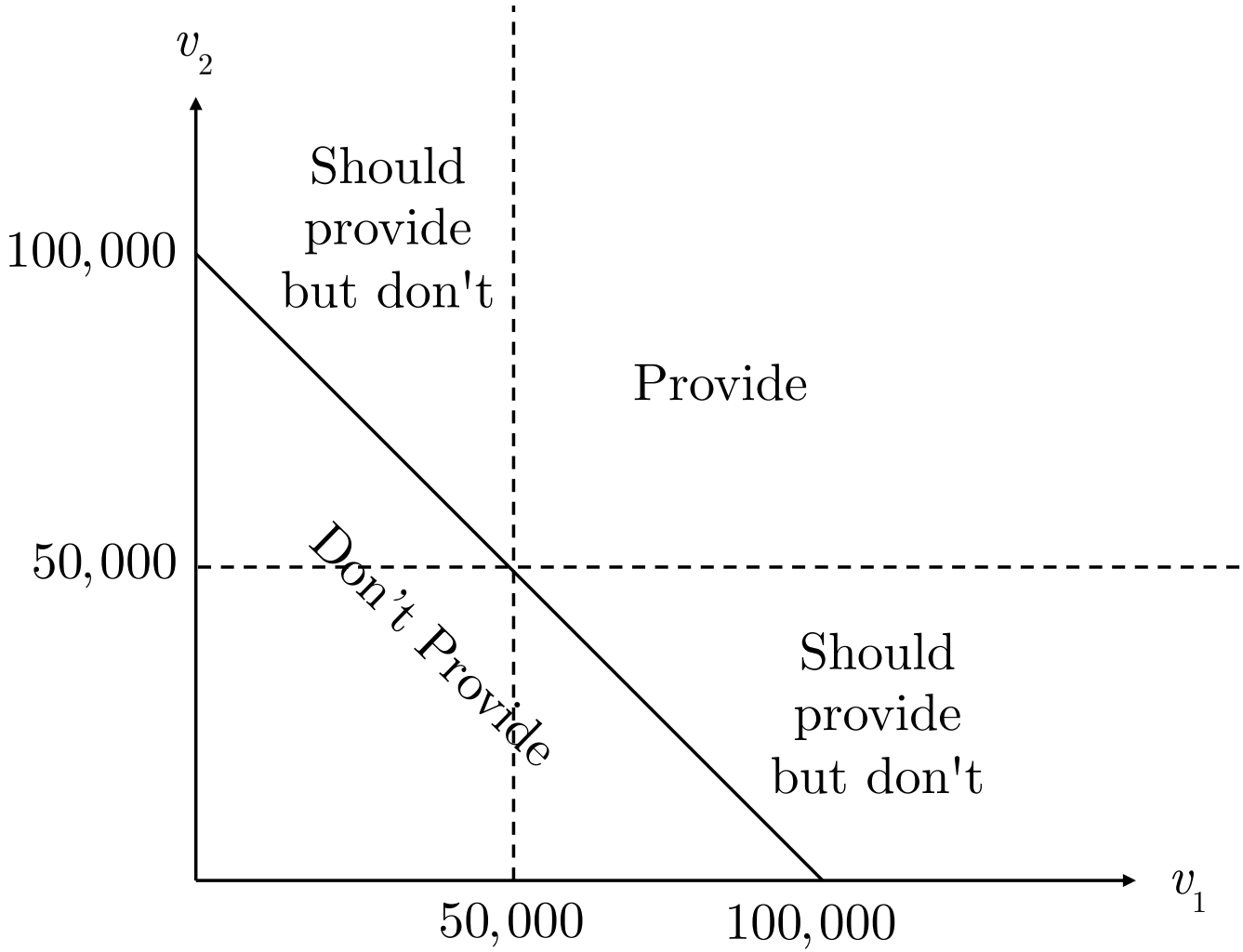
Player 1 lies



Player 2 lies



Public good under provided



Outline

VCG

Ask each agent their valuation

Policy

- Provide and divide the costs evenly if

$$s_1 + s_2 > 100,000$$

- Otherwise don't provide

Payment

- Pay each player their effect on other's value from policy

Player 1's Effect

If $s_1 + s_2 > 100,000$, player 2's value from policy

- with player 1: $v_2 - 50,000$
- without player 1: 0

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- with player 1: $v_2 - 50,000$
- without player 1: 0
- provide public good and pay player 1: $t = v_2 - 50,000$

If $s_1 + s_2 \leq 100,000$, player 2's value from policy

- 0 regardless of player 1's presence
- don't provide public good, don't pay player 1 anything

Player 2's Effect

Player 2 is analogous

If provide public good, pay Player 2: $v_1 - 50,000$

Remember the 2nd price auction

In the second price auction, the payment depended on the second place person's valuation

Here too the payment to each player depends only on the other player's statement

$$t^*(s_j) = s_j - 50,000$$

Not having people's personal valuation affect their payment is important for incentivizing truth telling

Player 1's payoffs

Suppose $s_1 + s_2 > 100,000$

- Provide public good
- Pay player 1 $t^*(s_2) = s_2 - 50,000$
- Player 1's payoff is

$$v_1 - 50,000 + t^*(s_2) = v_1 + s_2 - 100,000$$

Suppose $s_1 + s_2 \leq 100,000$

- Don't provide public good
- Player 1's payoff is 0

Aligned Incentives

Player 1 wants public good provided given payment $t^*(s_2)$ if

$$v_1 + s_2 > 100,000$$

Public good is provided if

$$s_1 + s_2 > 100,000$$

This aligns incentives so that it is weakly dominant for player 1 to tell the truth

Truth telling is weakly dominant

Suppose player 1 wants public good given $t^*(s_2)$
(i.e., $v_1 + s_2 > 100,000$)

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Suppose player 1 doesn't want public good given $t^*(s_2)$
(i.e., $v_1 + s_2 \leq 100,000$)

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An Example

Suppose $v_1 = 70,000$ and $v_2 = 45,000$

Player 1's payoff under VCG:

$$v_1 - 50,000 + t^*(v_2) = 70,000 - 50,000 + \overbrace{(45,000 - 50,000)}^{t^*(v_2)=-5,000}$$
$$= 15,000$$

Player 2's payoff:

$$v_2 - 50,000 + t^*(v_1) = 45,000 - 50,000 + \overbrace{(70,000 - 50,000)}^{t^*(v_1)=20,000}$$
$$= 15,000$$

What's wrong with the VCG?

Truth telling, utilitarian optimal policy, but...

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Suppose $v_1 + v_2 > 100,000$, total payments to players:

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Where does the money come from?

Gasoline Tax, Revisited

Sallee

- Winners and losers from gas tax
- Hard to identify winners and losers from data
- Can't design transfers to achieve Pareto improvement

Is there a more direct way to gather information and implement optimal policy?

VCG say only by giving winners and losers rents to reveal information

The need to pay rents undermines the Pareto improvement

Outline

Information is a Real Constraint

There is no way to simultaenously

- Incentivize truth telling
- Implement the utilitarian optimum
- Balance the budget

To get information, must give rents to informed

- Monetary payments
- Policies they like better than utilitarian optimum

Fauci Revisited

When polls said only about half of all Americans would take a vaccine, I was saying herd immunity would take 70 to 75 percent. Then, when newer surveys said 60 percent or more would take it, I thought, 'I can nudge this up a bit,' so I went to 80, 85.

Anthony Fauci

Extracting Information from Experts

Bureaucratic experts have information policy maker needs

To extract that information, have to give expert rents

For bureaucrats, rents usually aren't money

Some discretion over policy

- Sacrifice utilitarian optimum or policy makers preferred policy

Take Aways

Policy makers often need information from

- those they govern (studied here)
- those they oversee (similar issues)

Those with information often have incentive to misrepresent

There are ways to design incentives to get information

- VCG

But there are trade-offs

- optimal policy vs information rents