Pandering to Persuade

Yeon-Koo Che    Wouter Dessein    Navin Kartik

Columbia University

September 2011
Motivation

Decision makers often rely upon advice from interested agents

- business, politics, organizations, daily life

Some common features

- DM has partial knowledge about attributes of alternatives
- Agent is better informed
- Interests of agent and DM well-aligned over some alternatives but not among others
Examples

- Buyer decides which product to buy, if any, from a seller
  - Buyer has read public product reviews
  - Seller is better informed about products

- Investor must decide whether and which venture capital fund to invest in
  - Investor knows market trends
  - Venture capitalist is better informed about potential investments

- Dean decides whether to hire a new Econ faculty, and if so who
  - Dean can see a candidate’s CV, recommendation letters, etc.
  - Econ department can evaluate research better
What is the impact of differences in observable (or verifiable) information on cheap-talk communication of private (soft) information?

i.e., cheap talk when alternatives “look different” to DM
Our Baseline Framework

- **Discrete decision space**
  - There are \( n \geq 2 \) alternative projects and a status quo/outside option

- **Simple preference conflict structure**
  - DM and agent have no conflict amongst projects
  - Agent prefers any project to the outside option
  - DM prefers outside option (known value) to low-quality projects

- **Soft and hard information**
  - Some aspects of each project are observed by DM (or verifiable and endogenously disclosed by agent)
  - Others are unverifiable and can only be conveyed through cheap talk

Agent wants to persuade the DM to choose the best project over the outside option
Main Questions

- Credibility of communication
  - Is agent’s advice influential? Does agent recommend the best option?
  - Impact of observable information
  - Impact of outside option (preference conflict)
  - Properties of equilibria
    - Pandering to persuade
    - Pitching to persuade (credibility through comparisons)

- Commitment from DM
  - Pandering arises in an optimal mechanism (no transfers)
    - commitment and cheap talk qualitatively similar
    - but commitment mitigates magnitude of pandering distortion
    - simple implementation via delegation to an intermediary
  - Burning ships: reduce the value of outside option
  - Ignorance: better to not observe some information
Literature

- Seminal one-dimensional cheap talk
  - Crawford and Sobel (1982): continuous actions, different conflict
- Multidimensional cheap talk
  - Chakraborty and Harbaugh (2007): no pandering
- Pandering
  - Brandenburger and Polak (1996): not cheap talk
- Optimal delegation
    - Holmstrom (1977) and successors: different setup

Distinct from:

- Career concerns: Scharfstein and Stein (1990), Ottaviani and Sorensen (2001, 2007), ...
- Congruence signaling: Morris (2001), Ely and Välimäki (2003), Maskin and Tirole (2004), ...
Plan

Model

Example

General Analysis

Commitment & Other Responses

Conclusion
The Model: Basics

- 2 players: Principal/DM and Agent/advisor

- $N := \{1, 2\}$ alternative projects and a status quo (project 0)
  - can generalize to more than two alternative projects

- Status quo has known value $b_0 > 0$ to Principal, 0 to Agent

- Value of project $i \in N$ to both players is $b_i$, drawn from common prior cdf $F_i$
  - $F_i$ has a density $f_i$ with support $[b_i, \overline{b}_i]$
  - $0 \leq b_i < b_0 < \overline{b}_i \leq \infty$
  - $\exists \alpha$ s.t. $\mathbb{E}[b_i | b_i > \alpha{b_{-i}}] > b_0$ (relevant only if $b_{-i} > 0$)
  - $F_i$'s are independent but not necessarily identical
    - projects have observable components, generally asymmetric
    - can be endogenized with verifiable information revelation
The Model: Leading Examples

- Can view $F_i(b_i) \equiv F(b_i|v_i)$; with $v_i$'s commonly known

- Two leading families:

  Given parameters $v_1 \geq v_2 \geq 0$,

  1. Scale-invariant unif. distributions: $b_i \sim U[v_i, v_i + \bar{u}]$, for some $\bar{u} > 0$

  2. Exponential distributions: $b_i \sim Exp(v_i)$

All assumptions satisfied for $b_0$ not too large.
The Model: Timing

1. The agent privately observes \((b_1, b_2)\)

2. Agent sends a cheap-talk message to DM (large message space)

3. DM chooses a project or status quo

We are interested in the perfect Bayesian equilibria of this game.

**Lemma**

*Generically, there is no equilibrium in which a positive measure of types induce the DM to randomize between projects 1 and 2.*
The Model: Equilibrium

1. The cheap-talk game can thus be simplified to

   1. Agent “recommends a project”, i.e. sends message $m \in N$
   2. Principal’s strategy is vector of acceptance probabilities, $q \in [0, 1]^n$

2. $q$ characterizes an equilibrium

   Agent recommends project $i$ if

   $$q_i b_i > q_{-i} b_{-i}$$

   $q_i > 0$ only if

   $$\mathbb{E}[b_i|q_i b_i > q_{-i} b_{-i}] \geq \max\{b_0, \mathbb{E}[b_{-i}|q_i b_i > q_{-i} b_{-i}]\}$$

   with $q_i = 1$ when inequality is strict
An Example

- $b_1 \sim U[\frac{1}{3}, \frac{4}{3}];$ $b_2 \sim U[0, 1]$

- So project 1 “looks better”

- $\mathbb{E}[b_1 | b_1 > b_2] = 0.91 > 0.78 = \mathbb{E}[b_2 | b_1 < b_2]$

- Thus, a truthful equilibrium, $q = (1, 1)$
  - Agent recommends project $i$ if $b_i > b_{-i}$
  - DM chooses the recommended project

  exists if and only if $b_0 \leq 0.78$
An Example

What if $b_0 > 0.78$? There is no truthful eqm, but

- If $b_0 \leq \frac{5}{6} = \mathbb{E}[b_1]$, there is an uninformative eqm: $q = (1, 0)$
- If $b_0 > \frac{5}{6}$, there is a zero eqm: $q = (0, 0)$

- Both are rather inefficient outcomes given common interest over projects ... anything better?

- If $b_0 \in (0.78, 0.85)$, there is a (partially) informative eqm in which $q_1 = 1$ and $q_2 \in (0, 1)$
  - **Intuition:** Suppose $q_2$ falls below 1 ("DM gets tough on project 2")
    \[ \Rightarrow \text{Agent becomes more selective against 2 ("pandering toward 1") } \]
    \[ \Rightarrow \text{Posterior of project 2 improves, becoming acceptable to DM} \]
  - **Eqm constraints:**
    \[ (1) \mathbb{E}[b_2|2 \text{ proposed}] = b_0 \]
    \[ (2) \mathbb{E}[b_1|1 \text{ proposed}] \geq b_0 \]
Parametric Example: \( b_2 \sim U[0,1] \quad b_1 \sim U[1/3,4/3] \)

\[ b_0 \leq 0.78 \]

Truthful Equilibrium

\[ b_2 > b_1 \quad E(b_2) = 0.78 \quad [E(b_1) = 0.56] \]

\[ b_1 > b_2 \quad E(b_1) = 0.91 \quad [E(b_2) = 0.42] \]
Pandering to Persuade

Che, Dessein, Kartik

Parametric Example: \( b_2 \sim U[0,1] \quad b_1 \sim U[1/3,4/3] \)

\( b_0 = 0.8 \)

Informative Pandering Equilibrium

\((0.83)b_2 > b_1\)

\(E(b_2) = 0.8\)

\([E(b_1) = 0.5]\)

\(b_1 > (0.83)b_2\)

\(E(b_1) = 0.89\)

\([E(b_2) = 0.45]\)
Parametric Example: \( b_2 \sim U[0,1] \quad b_1 \sim U[1/3,4/3] \)

\[ b_0 = 0.85 \]

Informative Pandering Equilibrium

\[ (0.61)b_2 > b_1 \]

\[ E(b_2) = 0.85 \]

\[ E(b_1) = 0.42 \]

\[ b_1 > (0.61)b_2 \]

\[ E(b_1) = 0.86 \]

\[ E(b_2) = 0.48 \]
Pandering to Persuade

Parametric Example: \( b_2 \sim U[0,1] \quad b_1 \sim U[1/3,4/3] \)

\[ b_0 = 0.86 \]

No Pandering Equilibrium

\[ (0.57)b_2 > b_2 \]
\[ E(b_2) = 0.86 \]
\[ E(b_1) = 0.41 \]

\[ b_1 > (0.57)b_2 \]
\[ E(b_1) = 0.856 < b_0 \]
\[ E(b_2) = 0.48 \]

Pandering
Model

Example

**General Analysis**

Commitment & Other Responses

Conclusion
Pandering in General Model

Definition
An equilibrium \( q \)

1. is **influential** if \( q \gg 0 \)
   - wlog, we assume \( q_i > 0 \Rightarrow q_i \bar{b}_i > q_{-i} b_{-i} \)

2. is **truthful** if \( q_1 = q_2 = 1 \)

3. has **pandering** if it is influential and \( q_1 \neq q_2 \)
   - pandering toward the project with higher \( q_i \)

4. is **better than** equilibrium if it is interim Pareto superior
   - agent knows his type but DM does not
Pandering in General Model

- If $b_0$ is large enough, truthful equilibria won’t exist

- Any influential eqm in such cases will feature pandering towards some project

- Would like to identify systematically which project the agent panders toward
  - across equilibria for a given $b_0$
  - across different values of $b_0$

  and do comparative statics, welfare, etc.

- This requires a stochastic ranking of projects
Strong Order

Definition
The two projects are \textit{strongly ordered} if

\[
\mathbb{E}[b_1|b_1 > b_2] > \mathbb{E}[b_2|b_2 > b_1],
\]

(R1)

and, for any \( i \in \{1, 2\}, \)

\[
\mathbb{E}[b_i|b_i > \alpha b_{-i}] \text{ is nondecreasing in } \alpha \in \mathbb{R}_+
\]

(R2)

so long as the expectation is well-defined.

\begin{itemize}
  \item We say that project 1 “\textit{looks (conditionally) better}” than project 2
  \item (R1) is mild given non-identical projects
  \item (R2) is the important part: \textit{conditioning vs. selection} effects
  \item Leading examples satisfy strong order when \( v_1 > v_2 \)
\end{itemize}
General Pandering

Theorem

Assume projects are strongly ordered. There exist thresholds

\[ b_{0}^{**} \geq b_{0}^{*} := \mathbb{E}[b_{2} | b_{2} \geq b_{1}] \]

such that:

1. If \( b_{0} \leq b_{0}^{*} \), the best eqm is the truthful equilibrium: \( q^{*} = (1, 1) \)
General Pandering

Theorem
Assume projects are strongly ordered. There exist thresholds

$$b_0^{**} \geq b_0^* := \mathbb{E}[b_2 | b_2 \geq b_1]$$

such that:

1. If $b_0 \leq b_0^*$, the best eqm is the truthful equilibrium: $q^* = (1, 1)$

2. If $b_0 \in (b_0^*, b_0^{**})$, the best eqm is a pandering eqm with $q^* = (1, q_2^*)$ for some $q_2^* \in (0, 1)$:
   - the agent proposes project 2 if and only if $b_2 > b_1 / q_2^*$
   - $q^*$ is the largest eqm, i.e. $q^* > q$ for any other eqm $q$
   - An increase in DM’s outside option, $b_0$
     - increases pandering, i.e. decreases $q_2^*$
     - decreases expected payoffs of both Agent and DM

3. If $b_0 > b_0^{**}$, the only eqm is non-informative, $q^* = (0, 0)$.

Pandering to Persuade

Che, Dessein, Kartik
General Pandering: Discussion

- When $b_0 \in (b_0^*, b_0^{**})$, the agent would be worse off with a commitment to truthfully rank alternatives
  - Ability to distort rankings is not self-defeating
  - Agent wants DM to know that he is pandering!
- Both projects benefit from pandering compared to truthful ranking
  - Better-looking project recommended more often
  - Worse-looking project becomes credible and acceptable
- DM’s payoff is non-monotonic in outside option
  - can benefit from burning ships, i.e. reducing the outside option even at a cost
Ordering: Meaning of “Looks Better” (1)

- Under Strong Ordering, a project looks better than another if it's expectation is higher when recommended under truthful strategy.

- The ordering can be intuitive
  - Leading examples: exponential, scale-invariant uniform
  - Here, order coincides with ranking under ex-ante expectation
Ordering: Meaning of “Looks Better” (2)

But the ordering can also be less intuitive.

A job-market example:

Stanford \( b_S \sim U[2, 3] \)
Ohio \( b_O \sim U[1, 3] \)

Who “looks better”: Stanford or Ohio State Ph.D. student?

\[ \mathbb{E}[b_O | b_O > b_S] = 2.66 \]

\[ \mathbb{E}[b_S | b_S > b_O] = 2.55 \]

Can verify Ordering here, but OHIO is “conditionally better looking”!

\( \Rightarrow \) Pandering towards OHIO, even though \( \mathbb{E}[b_O] < \mathbb{E}[b_S] \)

Does NOT mean Ohio is recommended more often; rather, at the margin
Ordering: Meaning of “Looks Better” (3)

- Standard stochastic dominance relations and our “conditionally better looking” relation cannot be generally compared
  - $F_1$ can be dominated in LR (hence FOSD) by $F_2$ and yet satisfy strong order
  - $F_1$ can be dominated in SOSD by $F_2$ and yet satisfy strong order

- “Looking better” in a comparative ranking vs. in isolation

- A sufficient condition for (R1):
  - with common support: $\frac{f_2}{F_2} \frac{F_1}{f_1}$ is decreasing
  - if different supports, a generalization

- A sufficient condition for (R2):
  - for $i = 1, 2$: $F_i(b_i/\alpha)$ is logsupermodular
A recommendation becomes more likely to be accepted (“sellable”) when it is pitched in comparison to projects that are themselves stronger even if these projects are already accepted with prob 1. when proposed
Pitching

Theorem
Assume $F = (F_1, F_2)$ and $\tilde{F} = (\tilde{F}_1, \tilde{F}_2)$ both satisfy strong order, but each $F_i$ weakly dominates $\tilde{F}_i$ in likelihood ratio, one of them strictly.

Let $q^*$ and $\tilde{q}^*$ denote the best equilibria respectively. Then,

1. $q^* \geq \tilde{q}^*$

2. $q^* > \tilde{q}^*$ if $q^* > (0, 0)$ and $\tilde{q}^* < (1, 1)$.

Implications:

(a) Agent’s recommendation for Ohio is more acceptable when the alternative is Stanford than Brown.

(b) Ohio may prefer to compete with Stanford than Brown.

(c) Agent never benefits from “hiding” a project (by analogous result).
More than Two Projects

Definition
For $n > 2$, projects are strongly ordered if

1. For any $i < j$, and any $k \in \mathbb{R}_+$,
   \[ \mathbb{E}[b_i|b_i > b_j, b_i > k] > \mathbb{E}[b_j|b_j > b_i, b_j > k]. \]  
   (R1') whenever both expectations are well-defined.

2. For any $i$ and $j$, and any $k \in \mathbb{R}_+$,
   \[ \mathbb{E}[b_i|b_i > \alpha b_j, b_i > k] \text{ is nondecreasing in } \alpha \in \mathbb{R}_+. \]  
   (R2') so long as the expectation is well-defined.

- Satisfied by leading families when $\nu_1 > \nu_2 > \ldots > \nu_n$
- Previous results generalize under this strengthened ordering
  - Focus on largest equilibrium
  - Caveat that it may not be the best equilibrium for DM
Model

Example

General Analysis

Commitment & Other Responses

Conclusion
Simple Delegation

What happens if the decision is delegated to agent?

- Eliminates pandering
- But sometimes a project is chosen when principal prefers status quo

Theorem

Compared to any eqm $0 < q < 1$, the principal is strictly better off with unconstrained delegation to the agent.

Proof.

- Given pandering strategy, principal is indifferent between $q$ and $1$.
- Delegation implements the latter, but also eliminates pandering.

- Delegation requires credible commitment to not override whenever $q = 1$ is not an eqm
- Delegation may be beneficial even if $q = 0$ is the only eqm
Suppose the principle has rich commitment power. General mechanism design problem, without transfers.

First: a simple but restricted class of mechanisms, where the agent recommends a project, and the DM commits to an acceptance vector

- includes delegation and cheap talk as special cases

Is $q^D := 1$ the optimal commitment for the principal, at least when $q^D$ is preferred to $q = 0$?
**Theorem**

*If the best cheap-talk eqm, $q^*$, is such that $0 < q^* < q^D$, then the optimal simple mechanism is $q^M$ such that $q^* < q^M < q^D$.***

So no rubberstamping in optimal simple mechanism if no rubberstamping in communication eqm.

- $q^D$ not an eqm if and only if

$$E[b_2 | b_2 \geq b_1] < b_0$$

- Reducing $q_2$ slightly from 1 ⇒ 2nd order loss from pandering distortion, but 1st order gain from choosing $b_0$ sometimes when project 2 is recommended

- Since $E[b_2 | q^*_2 b_2 \geq b_1] = b_0$, raising $q^*_2$ slightly has no direct effect on principal’s utility

- But it reduces pandering

Can implement this decision rule by delegating decision-making to a third party whose value from the status quo is $b'_0 \in (0, b_0)$. 
Optimal Commitment (3)

- Now unrestricted class of mechanisms (but no transfers)
  - e.g. sometimes randomize between the two projects?
- Can focus on incentive-compatible direct mechanisms
  - mappings from \((b_1, b_2)\) to \(\Delta := \{(x, y) \in [0, 1]^2 : x + y \leq 1\}\)
- Key lemma: IC implies \((x(b), y(b)) = (x(b'), y(b'))\) if \(\frac{b_1}{b_2} = \frac{b'_1}{b'_2}\)
  - not trivial, because even though for the agent the ratio determines his preferences over \(\Delta\), the principal cares about the levels
- Reduce problem to one-dimensional, with agent’s type \(\theta := \frac{b_1}{b_2}\)
  - Can treat agent as if \(u(x, y, \theta) = x\theta + y\)
- Now \(y\) looks similar to a transfer in standard mechanism design
  - but the analogy is imperfect, because of probability constraint
Optimal Commitment (4)

Mild regularity condition that suitable “virtual valuation” is piecewise monotone:

\[ J(\theta) := -(1 - \theta)b_0 f(\theta) + \int_{\theta}^{\tilde{\theta}} \left( \mathbb{E} \left[ b_2 \mid \frac{b_1}{b_2} = s \right] - b_0 \right) f(s) ds. \]

Theorem

If \( q^* < 1 \), then the optimal simple mechanism is optimal in the class of all mechanisms.

- Optimal mechanism induces pandering
- Straightforward implementation of the optimal mechanism through intermediary delgation
Ignorance Can Be Bliss

Suppose there are two projects $A$ and $B$ that are ex-ante identical, but there will be a public signal $s \in S$ (finite set) about them after which communication game ensues.

Say that the signal is **value neutral** if

$$\mathbb{E}[\max\{b_A, b_B\}|s]$$

is the same for all $s \in S$ and **non-trivial** if

$$\mathbb{E}[b_A|b_A > b_B, s] \neq \mathbb{E}[b_A|b_A > b_B, s']$$

for some $s, s' \in S$.

**Theorem**

*If the signal is value neutral, the DM at least weakly prefers not observing the signal. If the signal is also non-trivial, then there is an interval of $b_0$ in which the DM strictly prefers not observing the signal.*

**Implications:**

- If DM cannot commit to anything after observing $s$, she would prefer to commit to not observing information (if possible).
- Can be optimal to appoint a less capable/informed DM.
Interpret $b_0 \in \mathbb{R}_+$ as an alternative developed by the principal at cost $c(b_0)$, where $c'(\cdot) > 0$. This is done after observing hard information but before soft information is communicated. Assume there is a solution to $\max[b_0 - c(b_0)]$.

Corollary

Assume that the largest equilibrium of communication game is played. Then depending on $(F_1, F_2)$, the principal chooses either

1. $b_0 = 0$ and rubberstamps the agent’s recommendation
2. $\hat{b}_0 > 0$ and never accepts agent’s recommendation

That is, no soft communication on eqm path, only hard info (reflected by $F_1, F_2$)
Conclusions

- New model of strategic communication/persuasion, relevant to wide variety of settings
  - equilibrium features interaction of hard and soft information: pandering and pitching to persuade
  - pandering arises even under full commitment for the DM

- Important (and potentially destructive) role of verifiable information
  - can distort and even crowd out the communication of soft information
  - DM might be better off not observing the verifiable information, or committing to ignore it
Some Extensions

- Routine
  - Variable project size
  - Private info of DM about outside option

- More Interesting: conflicts of interest between projects
  - E.g. agent gets $a \times b_1$ from project 1, for some $a > 0$
  - View pandering as distortion of agent’s true preference ranking
  - Agent now has an incentive to pander to counter preference bias
    - can reinforce or mitigate/reverse informational-pandering
  - Pandering can be good for the DM, e.g. if $a < 1$
  - Delegation may not be good
Future

- Multiple agents with distinct projects competing
  - Intuition: exacerbate pandering distortions
  - DM may be better off limiting the set of agents

- Information acquisition
  - Strong incentives to strengthen project distributions
    - delegation can demotivate, contrast to Aghion and Tirole (1997); cf. Che & Kartik (2009)
  - But may also distort effort incentives towards projects with observable characteristics
Thank you.
Weak Ordering

Definition
For $n = 2$, projects are **weakly ordered** if

$$\forall \alpha \geq 1, \ E[\alpha b_1 > \alpha b_2] > E[\alpha b_2 > b_1].$$

whenever the LHS and RHS are well-defined.

Theorem
Assume $n = 2$ and the projects are weakly ordered. Then, for any equilibrium $q$:

1. If $q_1 > 0$, then $q_1 \geq q_2$.
2. If $q_i > 0$ and $q_{-i} < 1$, then $q_i > q_{-i}$.
3. If $E[b_2 | b_2 \geq b_1] < b_0$, then $q_2 < 1$; otherwise, there is a truthful equilibrium.
Weak vs. Strong Ordering

- Weak Ordering can be satisfied even when $\mathbb{E}[b_1 | b_1 \geq \alpha b_2]$ is not increasing in $\alpha$ (hence Strong Ordering fails)

- Truncated Normal Example: $G_1 \sim N(5, 1)$ and $G_2 \sim N(4.5, 1)$
  Let $b_1$ and $b_2$ have support on $\mathbb{R}^+$ with

  $$f_i(x) = g_i(x) / [1 - G_i(0)]$$

  $\mathbb{E}[b_1 | b_1 > \alpha b_2]$ and $\mathbb{E}[b_2 | \alpha b_2 > b_1]$: 

  ![Graph showing the comparison of $\mathbb{E}[b_1 | b_1 > \alpha b_2]$ and $\mathbb{E}[b_2 | \alpha b_2 > b_1]$.](image)