Communication with Cultural Agents[1]

Brooklyn Han

MPhil Economics (2021-2023), University of Oxford

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[1]Supervised by Inés Moreno de Barreda and Daniel Quigley ☺

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Introduction

What is culture?

Figure: Culture as traditions and norms.

What is culture?

Figure: Culture as belief, identity and language.

Economic Implications of Culture

- Culture affects what people perceive to be attractive to them i.e. *salient*.
- Culture also affects how people coordinate with each other to collectively reach an outcome.
- As such, when there is uncertainty, people may react differently due to cultural factors.
- Communication should be tailored to the *culture* and *diversity* of the target population to achieve optimal outcomes.

Theory

- What is optimal communication as a function of culture?
- What are the social welfare implications of culture?
- When and how can information improve the coordination and welfare of culturally-driven agents?
- When players belong to different cultural groups, is public persuasion (one-size-fits-all information structure) better than private persuasion (targeted menus of information)?

Practice

- How can we better understand cross-country differences in Covid-related communication policies, or the role of communication in adopting new practices across firms?
- What are some empirically-testable predictions that the model could generate?

Hey! Wake up!

Figure: Hey! Wake up! It's time to do some micro theory!

Setup: Model, Timing, Equilibrium

Model of **information design in coordination games with culture**.

- Information design (Kamenica and Gentzkow, 2011)
- Information design in coordination games (Goldstein and Huang, 2016)
- Culture (Kets and Sandroni, 2019, 2021)
- Equilibrium selection (Morris et al., 2022)

Uh!!

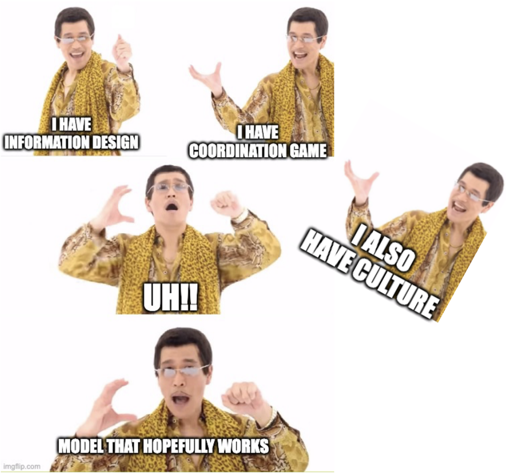

I HAVE
INFORMATION DESIGN
I HAVE
COORDINATION GAME
UH!!
I ALSO
HAVE CULTURE
MODEL THAT HOPEFULLY WORKS
imgflip.com

Figure: Uh!!

Coordination Game

- Continuum of players $N = [0, 1]$
- Actions $A = \{H, L\}$
- Payoffs

	H	L
H	u, u	$0, 0$
L	$0, 0$	l, l

$$u = \begin{cases} h & \text{with probability } \pi \\ l & \text{with probability } 1 - \pi \end{cases} \qquad h > l$$

- Uncertainty in (H, H) outcome. Prior belief $\pi = \pi_0$, common to all players.

- Sender: “benevolent **government**” or “manager”
- Receiver: “people in **society**” or “employees”
- Unknown state of the world u determines players’ payoffs in the (H, H) outcome.
- Sender commits to an **experiment**, defined as:
  - A set of **messages** the government can send $\mathcal{M} = \{high, low\}$
  - A **rule** for assigning results R.
    $R(m|u)$ is the probability of sending message $m \in \mathcal{M}$, given the true state of the world is $u = \{h, l\}$.

Timing

1. Government *commits* to an experiment before knowing the state of the world, $u = \{h, l\}$.
2. The true state u is realised and messages $m \in \mathcal{M}$ are generated from the rule R.
3. Receivers observe the message $m \in \mathcal{M}$ generated by R and update their beliefs via Bayes' Rule.
4. Receivers are pairwise-matched and play the coordination game.
5. Payoffs are realised.

Culture Societal culture.

Actions Players can choose to wear a face covering or not.

Preferences and Payoffs Players want to stay safe but also want to enjoy social interaction.

Coordination Wearing a face covering improves likelihood of staying healthy but makes social interaction awkward.

Uncertainty The payoff from both wearing a face covering is uncertain because both of you could still get infected.

Information Design Government tells society to either wear or not wear the face covering.

Motivating Example 2: Adopting New Tech

Culture Organisational culture.

Actions Employees can choose to use a new operating system or stay with the old one.

Preferences and Payoffs Employees want to ditch Windows 97 but also want to ensure they can work with coworkers.

Coordination Everyone using the same operating system in a company is more efficient.

Uncertainty The payoff from adopting a new operating system is uncertain.

Information Design Manager acting in the best interests of the company tells employees to adopt or not.

Culture means that different people find different things salient.

Since people want to coordinate with each other, they try to make initial contact with others through some imaginative process of introspection (Schelling, 1958).

Introspection is a realistic way of rationalising the fact that players want to *coordinate on the same action*. Contrast with other models of culture; see e.g. Young (1993); Greif (1994); Young (1998); Bisin and Verdier (2010).

Putting yourself in others' shoes...

Figure: "Now I understand that my hooman likes belly rubs just like me!"

Introspection (Kets and Sandroni, 2019, 2021)

"Action s_j is **salient** for j."

Each player j has random **impulse** I_j to take action $s_j \in \{H, L\}$.

- Impulses drawn from common prior $\mu(I_j, I_{-j})$.
- This is shaped by *culture*.

First instinct is to follow impulse.
$\Longrightarrow$ **Level-0 strategy:** $\sigma_j^0(I_j) = s_j$ whenever $I_j = s_j$.

Introspection: realises that others have impulses. Update beliefs using Bayes' Rule to form posterior $\mu(I_{-j}|I_j)$.

Formulate best response using posterior to level-0 strategies.
$\Longrightarrow$ **Level-1 strategy:** $\sigma_j^1(I_j) \in BR_j(\sigma_{-j}^0)$.

By inductive argument, **level-k strategy** $\sigma_j^k(I_j)$ is a best response to **level-(k-1) strategy** σ_{-j}^{k-1}.

Introspective equilibrium: $\sigma_j(I_j) := \lim_{k\to\infty} \sigma_j^k(I_j)$.

Common Knowledge of Rationality: Every introspective equilibrium is a correlated equilibrium.

- Allows for **Nash** and **non-Nash** behaviour (i.e. players might coordinate on outcomes that are not NE).

Existence and Uniqueness: Any "regular" game with strategic complementarities has an introspective equilibrium and it is *essentially* unique.

- Allows for the fact that, given an impulse distribution, different cultures can select different introspective equilibria.

Baseline Model of Culture

Culture influences what players perceive to be salient.

Notation: $\theta = s_j$ is the event that action s_j is **culturally salient**.

- With probability $\mathbb{P}(\theta = H)$, a share $q \in (\frac{1}{2}, 1)$ of players has impulse $I_j = H$.
- With probability $\mathbb{P}(\theta = L)$, a share $q \in (\frac{1}{2}, 1)$ of players has impulse $I_j = L$.
- q is a measure of **culture strength**.

Assume that $\mathbb{P}(\theta = H) = \mathbb{P}(\theta = L) = \frac{1}{2}$.

Strategic Uncertainty

- (1) Which action is culturally salient is random.
- (2) Given an action s_j is culturally salient, $q < 1$ means that a player with impulse $I_j = s_j$ knows that $1 - q > 0$ others will have a different impulse to them.

"Given that player j has an impulse $I_j = s'$, what is the probability that any other player $-j$ has the same impulse $I_{-j} = s'$?"

Law of Iterated Expectations

$$\begin{aligned}\mathbb{P}(I_{-j} = s'|I_j = s') &= \mathbb{P}(I_{-j} = s'|\theta = s')\mathbb{P}(\theta = s'|I_j = s') \\ &+ \mathbb{P}(I_{-j} = s'|\theta = s'')\mathbb{P}(\theta = s''|I_j = s') \\ &:= Q\end{aligned}$$

Culture

$$\mathbb{P}(I_{-j} = s' | \theta = s') = q \quad and \quad \mathbb{P}(I_{-j} = s' | \theta = s'') = 1 - q$$

Bayes' Rule

$$\mathbb{P}(\theta = s' | I_j = s') = q$$
$$\mathbb{P}(\theta = s'' | I_j = s') = 1 - q$$

Probability

$$\begin{aligned} Q &= \mathbb{P}(I_{-j} = s' | \theta = s')\mathbb{P}(\theta = s' | I_j = s') \\ &\quad + \mathbb{P}(I_{-j} = s' | \theta = s'')\mathbb{P}(\theta = s'' | I_j = s') \\ &= q^2 + (1 - q)^2 \end{aligned}$$

Level-1 Best Responses

H is a best response for a player with impulse $I_j = H$ *iff*

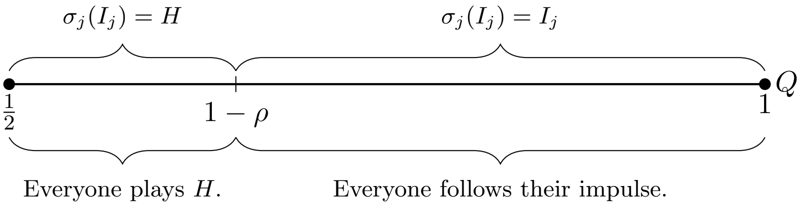
$$\begin{aligned} &\mathbb{P}(I_{-j} = H|I_j = H)\mathbb{E}u + \mathbb{P}(I_{-j} = L|I_j = H)0 \\ &\geq \mathbb{P}(I_{-j} = H|I_j = H)0 + \mathbb{P}(I_{-j} = L|I_j = H)l \\ &\implies Q\mathbb{E}u \geq +(1-Q)l \\ &\implies Q \geq \frac{l}{\mathbb{E}u + l} := \rho \end{aligned}$$

$\implies$ **Level-k Best Responses** due to first-order stochastic dominance.

Best Responses

$\sigma_j(I_j)$	I_j	Condition
H	H	$Q \geq \rho$
H	L	$Q < \rho$
L	H	$Q < 1-\rho$
L	L	$Q \geq 1-\rho$

Introspective Equilibrium



In the range $Q \in [1-\rho, 1)$, **everyone follows their impulse** ($\sigma_j(I_j) = I_j$). All four outcomes could arise.

Probabilities

- (H, H) *(good outcome)* $\frac{1}{2}(q^2 + (1-q)^2) = \frac{1}{2}Q$
- (H, L) *(miscoordination)* $q(1-q) = \frac{1}{2}(1-Q)$
- (L, H) *(miscoordination)* $q(1-q) = \frac{1}{2}(1-Q)$
- (L, L) *(inefficient lock-in)* $\frac{1}{2}(q^2 + (1-q)^2) = \frac{1}{2}Q$

For example,

$$\begin{aligned}\mathbb{P}(I_j = H, I_k = H) &= \mathbb{P}(\theta = H)\mathbb{P}(I_j = H|\theta = H)\mathbb{P}(I_k = H|\theta = H) \\ &+ \mathbb{P}(\theta = L)\mathbb{P}(I_j = H|\theta = L)\mathbb{P}(I_k = H|\theta = L)\end{aligned}$$

gives the required probability for (H, H).

Social welfare on the range $Q \in [1-\rho, 1)$ is
$\frac{1}{2}Q\mathbb{E}u + \frac{1}{2}l = Ql + \frac{1}{2}Q(h-l)\pi$, if society has prior π.

In the range $Q \in (\frac{1}{2}, 1-\rho)$, **everyone plays action** H $(\sigma_j(I_j) = H)$. Social welfare is $\mathbb{E}u = l + (h-l)\pi$.

Social Welfare v

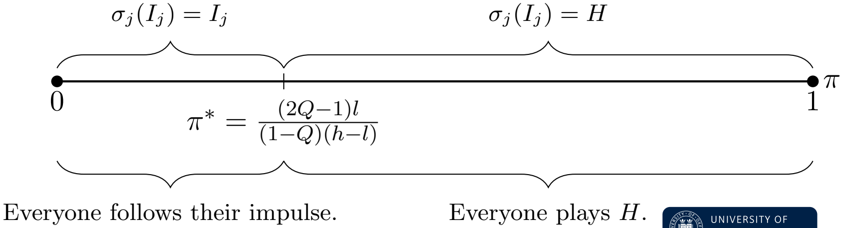
$$v(Q) = \begin{cases} l + (h-l)\pi & \text{if } Q \in (\frac{1}{2}, 1-\rho) \\ Ql + \frac{1}{2}Q(h-l)\pi & \text{if } Q \in [1-\rho, 1) \end{cases}$$

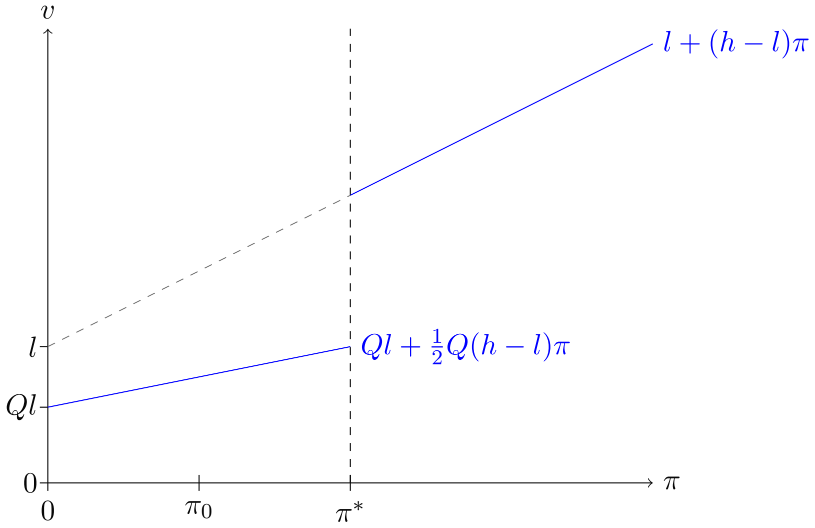
Social Welfare as a Function of Prior π

We are going towards information design, where the government influences society's beliefs while maximising social welfare. To do so, we need to write social welfare as a function of π.

$$Q \in (\frac{1}{2}, 1-\rho) \iff \pi \geq \pi^*$$
$$Q \in [1-\rho, 1) \iff \pi < \pi^*$$

where $\pi^* = \frac{(2Q-1)l}{(1-Q)(h-l)}$, obtained from $Q = 1 - \rho(\pi^*)$.





v
l + (h − l)π
l
Ql + ½Q(h − l)π
Ql
0
π
0
π₀
π*

Concavification

The concavification $\hat{v}$ of a function v is the smallest concave function that 'covers' v.

If $\pi^* \leq 1$,

$$\hat{v}(\pi) = \begin{cases} l + (h-l)\pi & \text{if } \pi^* \leq \pi \leq 1 \\ Ql + \frac{Q^2}{2Q-1}(h-l)\pi & \text{if } 0 < \pi < \pi^* \end{cases}$$

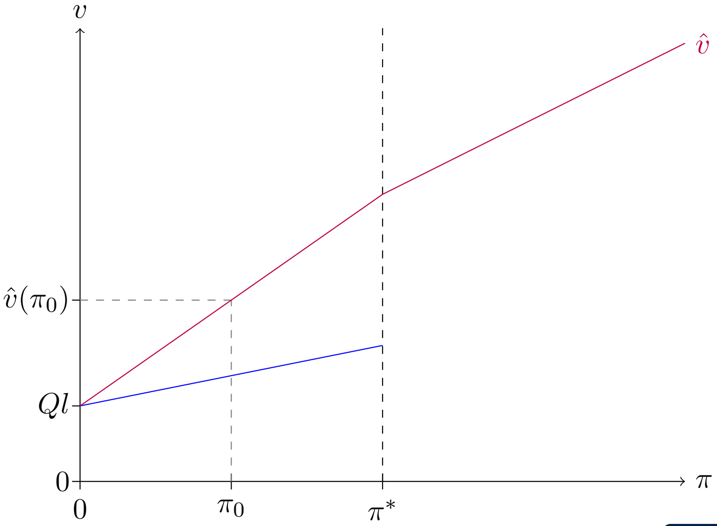
If $\pi^* > 1$,

$$\hat{v}(\pi) = Ql + \frac{1}{2}Q(h-l)\pi$$

Government's Optimal Payoff (Max. Social Welfare)
Social welfare is maximised at $\hat{v}(\pi_0)$ for any prior π_0.

This follows from Kamenica and Gentzkow (2011) that the sender's optimal payoff from persuasion is equal to the concavification evaluated at the prior.

Social Welfare and Concavification



The government cares about society's beliefs. Insight from Kamenica and Gentzkow (2011) tells us that we can treat information as if government *chooses* society's beliefs.

Information Structure
Information structure f is a lottery over beliefs $\{\pi_m\}_{m\in\mathcal{M}} = \{\pi_{high}, \pi_{low}\}$, where $f(\pi_m) \coloneqq \mathbb{P}(\pi = \pi_m)$ is the probability that society holds (posterior) belief π_m.

Bayes Plausibility
An information structure f is Bayes Plausible if

$$\sum_{m\in\mathcal{M}} f(\pi_m)\pi_m = \pi_0$$

$$\implies f(\pi_{high})\pi_{high} + f(\pi_{low})\pi_{low} = \pi_0$$

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Optimal Information Design

$$\pi_{high} = \pi^* \qquad \pi_{low} = 0$$

Government's Optimal Signal

$$R(m = high|u = h) = 1 \qquad R(m = low|u = h) = 0$$

$$R(m = high|u = l) = \frac{(1 - \pi^*)\pi_0}{\pi^*(1 - \pi_0)} \qquad R(m = low|u = l) = \frac{\pi^* - \pi_0}{\pi^*(1 - \pi_0)}$$

Bayes Plausibility

$$f(\pi_{high}) = \frac{\pi_0}{\pi^*} \qquad f(\pi_{low}) = 1 - \frac{\pi_0}{\pi^*}$$

Proposition

The government induces a higher *high*-posterior for stronger cultures; however, because of Bayes Plausibility, this is done less frequently. Equivalently, $\pi_{high} = \pi^*$ increases in Q but $f(\pi_{high})$ decreases in Q.

Stronger cultures are more prone to following their impulses, meaning that inferior i.e. non-(H, H) outcomes can arise. Government wants to induce a stronger posterior to guarantee (H, H) outcome, but this must be done less frequently to not arouse the suspicion of the population.

In other words, cultural strength **necessitates the trade-off that is already present in Bayes Plausibility**.

Proposition

The probability that the government sends the *high* message, given the state of the world is *l*, decreases in cultural strength. Equivalently, $\frac{\partial R(high|l)}{\partial Q} < 0$.

A society with a stronger culture has a higher posterior $\pi_{high} = \pi^*$. To induce this, government must send the *high* message less often when the state of the world is l, so that receiving a message of *high* strongly implies an h state of the world.

Proposition

Information design delivers no merit to a society with too strong a culture. Specifically, a society with cultural strength $Q > \frac{h}{h+l} := \bar{Q}$ cannot benefit from information design.

Proof involves showing $\frac{\partial \pi^*(Q)}{\partial Q} > 0$ and $\pi^* = 1 \iff Q = \bar{Q}$.

People belonging to a society with too strong a culture are too reliant on their impulses.

Information design cannot persuade them to change their actions, however high the posterior belief is.

As a function of Q,

$$\hat{v}(Q) = \begin{cases} l + (h-l)\pi & \text{if } Q \in (\frac{1}{2}, 1-\rho) \\ Ql + \frac{Q^2}{2Q-1}(h-l)\pi & \text{if } Q \in [1-\rho, \bar{Q}) \\ Ql + \frac{1}{2}Q(h-l)\pi & \text{if } Q \in [\bar{Q}, 1) \end{cases}$$

Proposition

Concavified social welfare is non-monotonic in cultural strength, and the non-monotonicity is 'stronger' when society has a lower prior.

A low prior belief makes concavified social welfare more 'curved' in the middle region.

(click on me!)

This is due to conflicting coordination and persuasion effects.

Consider the effect of a marginal increase in Q on $\hat{v}$. For simplicity, let $f(\pi_{low}) = 1 - \frac{\pi_0}{\pi^*} = f$ and rewrite concavified payoffs in the range $Q \in [1-\rho, \bar{Q})$ as:

$$\hat{v}(Q) = fQl + (1-f)(l + (h-l)\pi^*)$$

$$\frac{\partial \hat{v}}{\partial Q} = \underbrace{fl}_{\text{coordination effect} > 0} + \underbrace{[-(1-Q)l\frac{\partial f}{\partial Q}]}_{\text{persuasion effect} < 0}$$

1. **Coordination Effect:** Higher Q increases the probability of coordination by making it more likely that any two pairwise-matched individuals have the same impulse.

2. **Persuasion Effect: The government persuades society to have a low posterior more frequently, causing miscoordination to occur more frequently.**

   Higher Q increases f, the probability that society has the posterior $\pi_{low} = 0$; everyone follows their impulse, so miscoordination arises with probability $(1 - Q)$. With a zero-posterior, (H, H) and (L, L) payoffs are identical, so miscoordinating foregoes l.

Work in Progress

- Discuss the above results in the context of real-world examples (e.g. Covid-related communications in countries with different levels of cultural strength).

Full Model of Culture

Previously, assumed that everyone in society belonged to *one* homogeneous cultural group.

May be a reasonable illustration for homogeneous societies, but *diversity* is important, especially at larger macro levels (e.g. country).

Suppose there are *two cultural groups*, $\mathcal{G} = \{A, B\}$. Group membership is **observable**.

- Share α of the population belong to group A and β belong to group B.
- $\alpha + \beta = 1$ and $\alpha, \beta \geq 0$.
- WLOG, group B is the *minority* group, so $\beta \in [0, \frac{1}{2}]$.
- β is a measure of **diversity**.

- $\theta_G = s$ is the event in which the action $s \in \{H, L\}$ is *culturally salient* for group $G \in \mathcal{G}$, meaning that a proportion $q \in (\frac{1}{2}, 1)$ of players in group G have an impulse of s.
- We assume that $\mathbb{P}(\theta_G = s) = \frac{1}{2}$ for $s \in \{H, L\}$ and $G \in \mathcal{G}$.
- Let $I_j^G = s$ be the event where individual j in group G has impulse s.
- $\mathbb{P}(I_j^G = s | \theta_G = s) = q$.

Imperfect Correlation of Cultural Salience Across Groups

Specifically, given that one group finds action s more salient, the other group is more likely to find s salient, rather than $s' \neq s$, but not perfectly so.

	$\theta_B = H$	$\theta_B = L$
$\theta_A = H$	$\frac{1}{4}(1+\eta)$	$\frac{1}{4}(1-\eta)$
$\theta_A = L$	$\frac{1}{4}(1-\eta)$	$\frac{1}{4}(1+\eta)$

where $\eta \in (0,1)$.

Define $d = 1 - \eta \in (0,1)$ as the **cultural distance** between groups.

An important consequence of imperfectly correlated cultural salience is that **a player believes that someone from their own group is more likely to have the same impulse, than someone from the other group**.

$$Q_{in} := \mathbb{P}(I^G_{-j} = s | I^G_j = s) = q^2 + (1-q)^2$$
$$Q_{out} := \mathbb{P}(I^{G'}_{-j} = s | I^G_j = s) = d\frac{1}{2} + (1-d)Q_{in}$$

Since $d \in (0,1)$, $Q_{in} > Q_{out} > \frac{1}{2}$.

Best Responses

- Group membership is **observable**.
- Depends on who matches with whom: two players from the same group, or two players from different groups.
- Best responses for two players from the same group identical to baseline model.

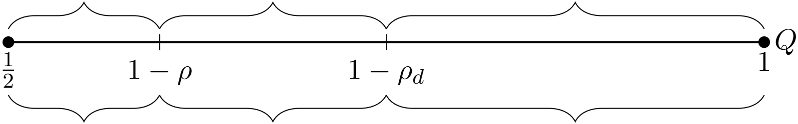
Best Responses for Different-Group Players

$$\mathbb{P}(I_{-j}^{G'} = H | I_j^G = H)\mathbb{E}u \geq \mathbb{P}(I_{-j}^{G'} = L | I_j^G = H)l$$
$$\implies Q_{out}\mathbb{E}u \geq +(1 - Q_{out})l$$
$$\implies Q_{out} \geq \frac{l}{\mathbb{E}u + l}$$
$$\implies Q_{in} \geq \frac{1}{1-d}\frac{l}{\mathbb{E}u + l} - \frac{d}{1-d}\frac{1}{2} := \rho_d$$

$$j, j' \in G \implies \sigma_j(I_j) = I_j$$

$$j \in G, j' \in G' \implies \sigma_j(I_j) = H$$

$\sigma_j(I_j) = H$ $\sigma_j(I_j) = I_j$

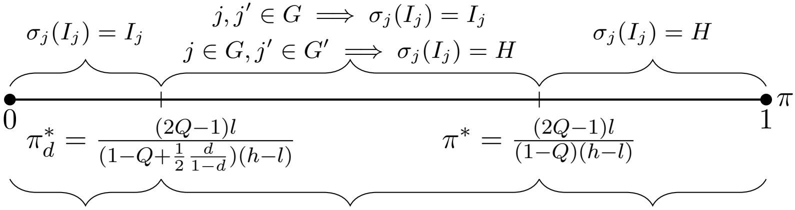


Everyone plays H. Everyone follows their impulse.

Player matched to someone from the same group follow impulse.

Player matched to someone from different group plays H.

Introspective Equilibrium



Everyone follows their impulse.

Everyone plays H.

Player matched to someone from the same group follow impulse.

Player matched to someone from different group plays H.

If $\pi_d^* < \pi^* \leq 1$,

$$v(\pi) = \begin{cases} \mathbb{E}u & \text{if } \pi \in [\pi^*, 1] \\ \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + 2\beta(1-\beta)\mathbb{E}u & \text{if } \pi \in [\pi_d^*, \pi^*) \\ \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + \frac{1}{2}Q_{out}(2\beta(1-\beta))(\mathbb{E}u + l) & \text{if } \pi \in [0, \pi_d^*) \end{cases}$$

If $\pi_d^* \leq 1$ and $\pi^* > 1$,

$$v(\pi) = \begin{cases} \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + 2\beta(1-\beta)\mathbb{E}u \\ \qquad\qquad\qquad\qquad\qquad\qquad \text{if } \pi \in [\pi_d^*, 1] \\ \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + \frac{1}{2}Q_{out}(2\beta(1-\beta))(\mathbb{E}u + l) \\ \qquad\qquad\qquad\qquad\qquad\qquad \text{if } \pi \in [0, \pi_d^*) \end{cases}$$

If $\pi^* > \pi_d^* > 1$,

$$v(\pi) = \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + \frac{1}{2}Q_{out}(2\beta(1-\beta))(\mathbb{E}u + l)$$

Work in Progress:

- Social welfare as a function of Q, β and d.
- $\bar{Q}_d = \frac{h}{h+l} + \frac{1}{2}\frac{d}{1-d}\frac{h-l}{h+l}$
- Need to consider $v(\beta)$ for each case separately, since there is no mapping between β and each of the thresholds.
- Allows me to examine **comparative statics**.

If $\pi_d^* < \pi^* \leq 1$ *and* d, β not too high,

$$\hat{v}(\pi) = \begin{cases} \mathbb{E}u & \text{if } \pi \in [\pi^*, 1] \\ \frac{h-l}{2Q_{in}-1}\Big\{(1-2\beta(1-\beta)d)Q_{in}^2 + 3\beta(1-\beta)dQ_{in} - \beta(1-\beta)d\Big\}\pi \\ +\Big\{(1-2\beta(1-\beta)d)Q_{in} + \beta(1-\beta)d\Big\}l & \text{if } \pi \in [0, \pi^*) \end{cases}$$

If $\pi_d^* < \pi^* \leq 1$ *and* d, β sufficiently high,

$$\hat{v}(\pi) = \begin{cases} \mathbb{E}u & \text{if } \pi \in [\pi^*, 1] \\ \frac{h-l}{2Q_{in}-1}\Big\{(2-\frac{1}{d})(\beta^2+(1-\beta)^2)Q_{in}^2 \\ +(4\beta(1-\beta)+\frac{1-d}{d}(\beta^2+(1-\beta)^2)Q_{in}-2\beta(1-\beta)\Big\}\pi \\ + \quad \textbf{Intercept} & \text{if } \pi \in [\pi_d^*, \pi^*) \\ \frac{h-l}{2Q_{in}-1}\Big\{(1-2\beta(1-\beta)d)Q_{in}^2+(2\beta(1-\beta)d \\ -\frac{1}{2}(\beta^2+(1-\beta)^2))Q_{in}+(\beta(1-\beta)\frac{d}{1-d}-\frac{1}{2}\beta(1-\beta)\frac{d^2}{1-d} \\ -\beta(1-\beta)d)\Big\}\pi+\Big\{(1-2\beta(1-\beta)d)Q_{in}+\beta(1-\beta)d\Big\}l \\ & \text{if } \pi \in [0, \pi_d^*) \end{cases}$$

If $\pi^* > 1$ and $\pi_d^* \leq 1$, for all β, d,

$$\hat{v}(\pi) = \begin{cases} \frac{1}{2}Q_{in}(\beta^2 + (1-\beta)^2)(\mathbb{E}u + l) + 2\beta(1-\beta)\mathbb{E}u \\ \qquad\qquad\qquad\qquad \text{if } \pi \in [\pi_d^*, 1] \\ \frac{h-l}{2Q_{in}-1}\Big\{(1 - 2\beta(1-\beta)d)Q_{in}^2 + (2\beta(1-\beta)d \\ -\frac{1}{2}(\beta^2 + (1-\beta)^2))Q_{in} + (\beta(1-\beta)\frac{d}{1-d} - \frac{1}{2}\beta(1-\beta)\frac{d^2}{1-d} \\ -\beta(1-\beta)d)\Big\}\pi + \Big\{(1 - 2\beta(1-\beta)d)Q_{in} + \beta(1-\beta)d\Big\}l \\ \qquad\qquad\qquad\qquad \text{if } \pi \in [0, \pi_d^*) \end{cases}$$

If none of the above cases apply, then $\hat{v} = v$.

Figure: Algebruh.

Proposition

For a very diverse society with very distant cultural groups, it is optimal for the government to induce a non-zero *low* posterior.

Equivalently, optimal information structure induces posteriors $\pi_{high} = \pi^*$ and $\pi_{low} = \pi_d^* > 0$, each with positive probability. (click on me!)

Alternative Model
Recall that group membership is observable.

When group membership is not observable, players form expected payoffs using share of minority β as a probability (i.e. probability that the player they are matched with is from the minority β or majority $1 - \beta$).

In this model, it is *never* optimal to induce a non-zero *low* posterior.
(click on me!)

Work in Progress:

- **Intuition** for why this is.
- Government's optimal signals i.e. $R(m|u)$ for $m \in \{high, low\}$ and $u \in \{h, l\}$.
- Probability of inducing posteriors in each of the above cases (π_{high} and π_{low} will differ), using Bayes Plausibility.
- Relate this result to real-world examples.

- Culture affects what people perceive to be salient *(theory of mind)*.
- In the baseline model, concavified social welfare is piece-wise and non-monotonic in cultural strength *(conflicting coordination and persuasion effects)*.
- Players from different cultural groups find it harder to put themselves in each other's shoes *(Q_{out} and Q_{in})*.
- Introspective equilibrium with diversity and distance depends on who is pairwise-matched with whom.
- Diversity and distance affect the optimal information structure; for a society that is very diverse with very distant groups, optimal to induce a non-zero *low* posterior.

Thank you!

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