Coordination Problems

A Simple Coordination Game: What Side of the Street?

		Driver 2	
		L	R
Driver 1	ℓ	$5^{\checkmark}, 5^{\checkmark}$	$0, 0$
	r	$0, 0$	$5^{\checkmark}, 5^{\checkmark}$

- Two equilibria: (ℓ, L) and (r, R)
- Pure coordination game—drivers care only about choosing the same side

Coordination with Distributional Concerns: Accounting Standards

		Britain: US	Britain: UK
America	us	$5^{\checkmark}, 1^{\checkmark}$	$0, 0$
	uk	$0, 0$	$1^{\checkmark}, 5^{\checkmark}$

- Two equilibria: (us, US) and (uk, UK)
- Coordination with distributional consequences—players want to coordinate, but disagree on preferred outcome

Coordination with Efficiency Concerns: Investing in a Developing Country

		Firm 2: Invest	Firm 2: Don't
Firm 1	invest	$20^{\checkmark}, 20^{\checkmark}$	$0, 5$
	don't	$5, 0$	$5^{\checkmark}, 5^{\checkmark}$

- Two equilibria: (invest, Invest) and (don't, Don't)
- (invest, Invest) Pareto dominates (don't, Don't)

Coordination Trap

Multiple equilibria

One equilibrium Pareto dominates another

Players can become "trapped" in an inefficient equilibrium

How? — reinforcing expectations

Some examples of coordination traps

Social Conventions

- Foot binding
- Honor killings
- Private vs public schools

Economic

- Underdevelopment
- Agglomeration economies
- Technology adoption

Political

- Failure of accountability
- Revolutions/Protests

Example: Investing and Agglomeration

2 firms decide how much to invest in a city: $e_i \in [0, 1]$

Revenues: $\pi(e_1, e_2) = e_1 \times e_2$

Costs: $\frac{1}{2} \times e_i^2$

$$u_i(e_1, e_2) = \pi(e_1, e_2) - \frac{e_i^2}{2} = e_1 \times e_2 - \frac{e_i^2}{2}$$

Player 1's Best Response

$$u_i(e_1, e_2) = \pi(e_1, e_2) - \frac{e_i^2}{2} = e_1 \times e_2 - \frac{e_i^2}{2}$$

$$\frac{\partial u_1(e_1, e_2)}{\partial e_1} = e_2 - e_1$$

$$\text{BR}_1(e_2) = e_2 \qquad \text{BR}_2(e_1) = e_1.$$

Each firm wants to match the other firm's investment level

Equilibrium Investment

Any strategy profile where $e_1 = e_2$ is an equilibrium!

Equilibrium payoffs: Let $e = e_1 = e_2$

$$u_i(e, e) = e^2 - \frac{e^2}{2} = \frac{e^2}{2}$$

Equilibrium payoffs are strictly increasing in e for both firms

Larger joint investments lead to Pareto improvements *and are equilibria*

The Coordination Trap

Each firm investing 0 is an equilibrium: $u_i(0,0) = 0$

Each firm investing $\frac{1}{2}$ is an equilibrium: $u_i(\frac{1}{2},\frac{1}{2}) = \frac{1}{8}$

Each firm investing 1 is an equilibrium: $u_i(1,1) = \frac{1}{2}$

Self fulfilling expectations can create Pareto inefficient equilibrium outcomes

- Underdevelopment
- Underinvestment in education

Policy Responses to Coordination Traps

Insurance

- Suppose policy maker promises to "top up" other player's investment
- Never end up having to actually do so

FDIC

Banking Acts of 1933 and 1935 create Federal Deposit Insurance Corporation (FDIC) in response to bank runs of the Grat Depression

Guarantees depositors won't lose money, even if bank is insolvent

All but eliminates bank runs in the United States

But also creates a moral hazard problem—banks can take bigger investment risks

- Financial crisis of 2007
- There are *always* second best concerns

Policy Responses to Coordination Traps

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Communication and Leadership:

- Create a mutual expectation that others will invest

Footbinding

Footbinding appears in 11th century

Spreads gradually from royalty to all of society over 300 years

Becomes more extreme over time

Social Norm by Ming Dynasty (1368-1644)

In 1835, 50-80 percent of women (depending on locale)

Ending Footbinding

Foot binding is a coordination trap

- Coordination on bad outcome

Late 19th century societies

- Education
- Public relations
- Advocacy for "natural feet"

Tighsien (rural area south of Beijing)

- 1889: 99%
- 1899: 94%
- 1919: 0%

Female Employment in Saudi Arabia

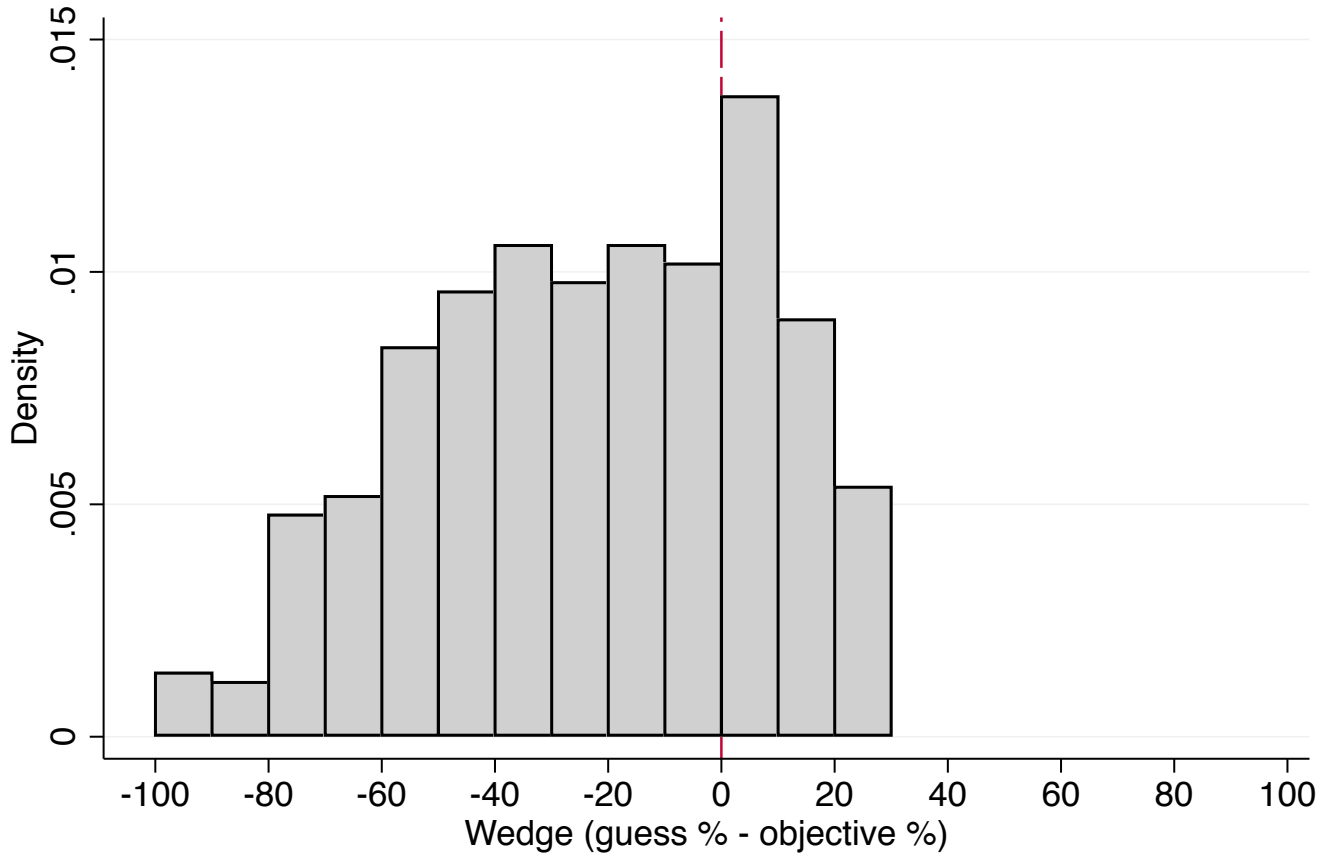
Women require formal approval of husband or father to work

Men believe that allowing women to work is not approved of

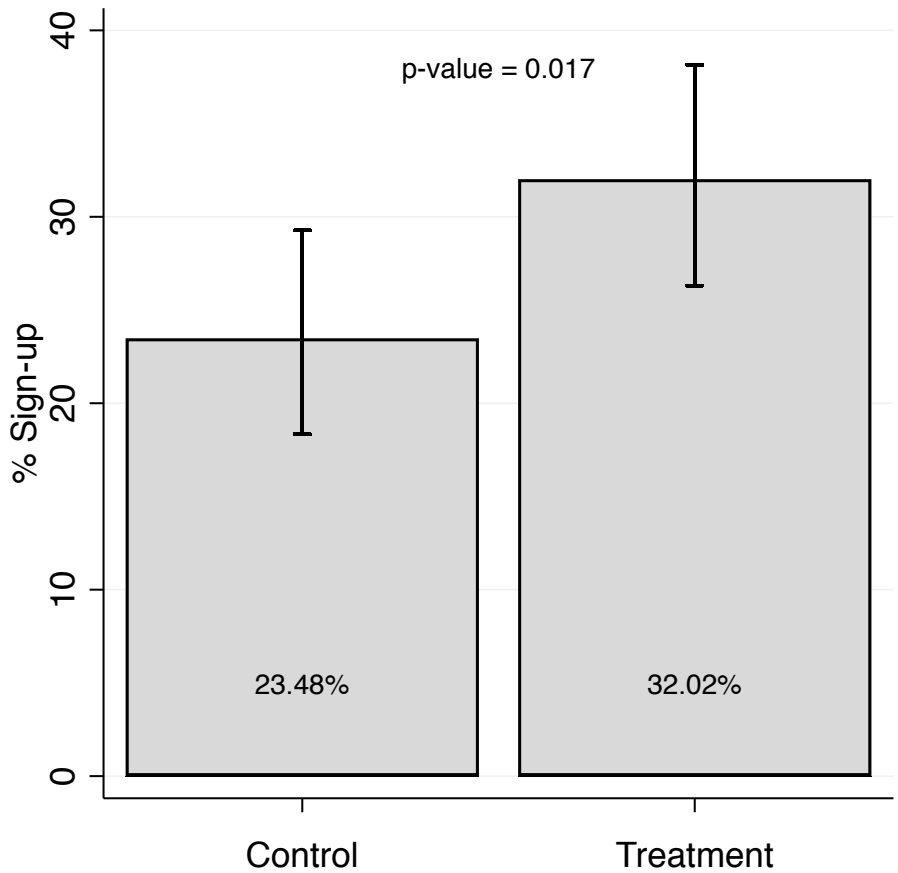
Thus, men prevent women from working

Changing mens' perceptions of what other men believe leads to large behavioral changes

Men's perceptions of other mens' views vs. reality



Effect of informing men of true views of other men on willingness to let women work



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Short-run interventions

- Fundamentally different than externalities because new behavior is also an equilibrium
- This tells us about the scope of leadership

The Tennessee Valley Authority

Starting in 1930s, TVA is a massive federal investment to modernize the economy of one of the poorest and least developed areas of the country

- Hydroelectric dams
- Canals
- Road networks
- Schools

1940s and 1950s, spent over $14 billion (2000 dollars)

1930: Tennessee Valley is almost entirely agricultural

1945: Largest supplier of electricity in the country

Long Run Effects

TVA subsidies decline starting in 1960s

Gains in agricultural sector disappears

- After 1960, TVA counties have a 13-16 percentage point decrease in ten-year agricultural employment growth

Manufacturing gains persist

- After 1960, TVA counties continue to have a growth rate that is 3 percentage points higher than non-TVA counties

In sectors with agglomeration economies (and, so, coordination traps), a short run intervention creates a new equilibrium that persists after the intervention

Summing Up Coordination Traps

Multiple equilibria with one Pareto dominated by another

Communication and leadership

Insurance

Short-run rather than long-run policy interventions

Take-Aways

Reinforcing expectations can lead to bad outcomes

Policy interventions are quite different than in externalities situations because the goal is simply to move people to a different equilibrium

- Short-run interventions
- Communication and leadership