3. Signalling: Using an Informational Advantage

The ♂ red stag’s antlers are almost useless in fighting, but...

A biological signal such as a pair of antlers actually must have a “cost”, or deleterious effect on viability, if it is to be taken seriously (by the doe ♀, the potential mate).

Furthermore, the cost must be one that stronger stags can pay more easily than their weaker brethren.

The cost or handicap is a guarantee of the honesty of the display. If there were no cost, then there would be rampant cheating, and observers would quickly learn to ignore the false advertising. (A babbling equilibrium.)
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Evolution produces cumbersome antlers because signalling to the ♀ an unmistakeable message about the ♂’s superior constitution more than compensates for the aggravation, or cost, of supporting the antlers.
Strategic Uses of Information 2

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Evolution produces cumbersome antlers because signalling to the ♀ an unmistakable message about the ♂’s superior constitution more than compensates for the aggravation, or cost, of supporting the antlers.

∴ Compare “costly signalling” with “cheap talk.”
**Credibility?**

If you have an incentive to exaggerate your own worth, how can you *credibly* convey your private information?
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  What if there is some action — *a signal* — that is costly to take and which is visible to the other party, which is more costly if lying than if telling the truth?
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- **How else?**

  What if there is some action — *a signal* — that is costly to take and which is visible to the other party, which is more costly if lying than if telling the truth? Then the other party might see the action and infer truth telling.
**Signalling** unobserved attributes

Signals are a form of *credible communication*:
Signalling unobserved attributes

Signals are a form of credible communication: putting one’s money where one’s mouth is;
**Signalling** unobserved attributes

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When signalling cannot occur — when information cannot be credibly communicated — markets don’t function well, and inefficiencies occur. (See the sub-prime mortgage crisis.)

An inefficient outcome: although possible (with complete information), mutually beneficial trade does not occur.
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Nor does the existence of a signalling method ensure that signalling occurs: a market equilibrium may occur in which no-one succeeds in signalling, or some, but not others, may be able to signal.
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Signalling unobserved quality, not price.
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Signalling unobserved quality, not price.

Can sellers signal quality?
Reputation, third-party credentials.
For insurance, medical checks compulsory.
But limited elimination of informational asymmetries.

Credibly?
Countersignalling: Reverse Snobbery?

(Reading 28 on “Signal Failure” from the Economist):

The job market:
**Countersignalling: Reverse Snobbery?**

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With three (not two) types, “countersignalling” (i.e., pretending to be less bright than they are) is a way that the Top types can distinguish themselves from the Middle types.
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And by playing cool about their grades, they separate themselves from the eager Middle types.
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But now both Middle and Top types play cool ...
4. Education as a Signal

*How could Sally signal her good car’s quality?*

Mike Spence, erstwhile dean of the Stanford GSB, shared the Nobel in 2001 for his research on signalling.

*A guarantee or warantee is more costly for Sally selling a “lemon” than for selling a good car, and so can signal quality.*
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_How could Sally signal her good car’s quality?_

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A _guarantee_ or waranttee is more costly for Sally selling a “lemon” than for selling a good car, and so can signal quality.

_Signals_ can overcome informational frictions, to reduce inefficiencies, but not always, or not always efficiently.

Potential employees can use their _training or education_ as a signal, especially if training is more costly for less competent students ...
A worker’s unobservable quality

Betty the boss wants to hire Wally the worker, but can’t tell (private info) whether Wally is:

- highly productive (HP) or
- less productive (LP) before hiring him.
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Assume that schooling costs a LP worker more than an HP worker: $120 against $60. Why? Extra tutoring, etc.

Q:
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Assume that schooling costs a LP worker more than an HP worker: $120 against $60. Why? Extra tutoring, etc.

Q: Can Wally’s educational level credibly signal his innate worth?
A self-confirming Bayesian equilibrium in beliefs:

Wally and Betty begin with beliefs about how to interpret signals, and equilibrium means that, after each acts on his or her beliefs, neither sees anything to indicate the beliefs are mistaken.

(See Bayesian equilibrium: D&Sk, 2nd ed. pp. 284, 3rd ed. p. 341; B&F Ch. 13)

Betty’s beliefs or expectations are crucial:
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  Without the diploma, HP Wally earns net $100,
  \[ \therefore \text{education is profitable for HP Wally.} \]

- If Wally is LP and has no diploma, then he earns net $100.
  With the diploma LP Wally earns net $200 − $120 = $80,
  \[ \therefore \text{education is unprofitable for LP Wally.} \]
A separating equilibrium:

Low Prod.  High Productivity

Diploma  No Ed.  Diploma  No Ed.

B  B  B  B

Offer expected value = \(0 \times 100 + 1 \times 200 = 200\)

Offer expected value = \(1 \times 100 + 0 \times 200 = 100\)

Offer e.v. $200  Offer e.v. $100

\((80, -100)\)  \((100, 0)\)  \((140, 0)\)  \((100, 100)\)
A separating equilibrium:

- Betty's expectations are fulfilled, and so are Wally's.

Education as Signalling with Separating. (W,B)

<table>
<thead>
<tr>
<th></th>
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As eepar ating equilibr ium:

| Offer expected value = | $200 | $100 |
| 0×100+1×200 = | $200 | $100 |

($80,−$100)  ($100,$0)  ($140,$0)  ($100,$100)
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For education to serve as a signal in this example, sufficient that it be:

— hard (costly) enough to obtain to deter LP Wally,
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How is the credential set?

➢ By history or custom?

➢ A social convention about the level of signalling sufficient for credibility.

➢ Is an M.B.A. a credible signal in Australia in 2009?
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Signalling need not work: \(\Rightarrow\) pooling, not separating.

A change in Betty’s beliefs can change the equilibrium considerably:

- Suppose Betty believes instead that although a diploma implies HP, without a diploma Wally could be HP or LP. She can’t distinguish the two.
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- Wally with a diploma (HP) is paid $200.

Q:
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Q: Will Wally obtain a diploma?
What is the new equilibrium?
Will Wally obtain a diploma?

➢ To HP Wally, the value of education is wage minus education costs: $200 − $60 = $140, i.e. less than the $160 Wally could earn without a diploma, ∴ education doesn’t pay, even for HP Wally.

➢ To LP Wally, the diploma payoff is $200 − $120 = $80, but no diploma → $160, ∴ no diploma for him, either.
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→ A pooling Bayesian equilibrium in beliefs.
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Equilibrium without signalling, even though a signal (education) is available to workers. Signalling cannot be guaranteed to work.
**Will Wally obtain a diploma?**

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*Again, Betty’s expectations are crucial.*
A pooling equilibrium:

Offer expected value = $200
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($160, −$60)

Offer e.v. $200
($140,$0)

Offer e.v. $160
($160,$40)
**A pooling equilibrium:**

![Diagram showing a pooling equilibrium with transitions between low and high productivity, education choices, and expected values.](image)

**Education as Signalling, with Pooling.** (W,B)

<table>
<thead>
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(Bayesian Equilibrium in beliefs)
“Wasteful” Expenditures as Signals

Generally: expenditures — such as education — even if yield no direct benefit in themselves, can serve as communication devices, signals. Any observable expenditures that are cheaper for “good” signallers than for “bad” signallers might work.

“Try it, you’ll like it.”
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How costly should signals be?
**How costly should signals be?**

Signals must be more costly (net of future earnings) for low-quality producers than for high-quality producers.
**How costly should signals be?**

Signals must be more costly (net of future earnings) for low-quality producers than for high-quality producers.

Wasteful expenditures don’t necessarily work as signals: opportunities for signalling don’t ensure that signalling actually occurs in the market.

(See Betty’s beliefs above.)
Signalling is pervasive.
Signalling is pervasive.

“When you drive around in a [$900,000] Rolls Royce and seem to be spending all this money, everyone starts to prick their ears up about what’s going on,” says Jim Cousins, the chairman of the business lobby group, The Committee for Geelong. “All the way through I thought maybe he [Graeme Hay, former founder of the failed Ponzi scheme, Chartwell Enterprises, had] won one of those $40 million Tattslotto draws.”

Chartwell quoted some returns up to 30% pa, and lost up to $70 million of more than 100 of their retail investors.

— AFR, 5 May, 2008, p. 61, “Rolling in everyone else’s cash”.
More signalling ...
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By giving a personal guarantee against his private assets, Alan tried to credibly communicate (to signal) that he believed the project wouldn’t fail, in order to induce the Bank to lend him more. The bank (or the venture capitalist) might still want to check Alan’s judgement, but not — Alan hopes — his sincerity.
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e.g. Don’t eat at a restaurant in Japan with poor-quality plastic models of its meals on display.

Nothing succeeds like the appearance of success.

— Christopher Lasch
5. The Market for “Lemons”

— see Reading 7 (The lemon dilemma).

Previously, there was uncertainty in Burt the buyer’s valuation of the car, unobservable by seller Sally. Now, there is uncertain quality of the car, unobservable by Burt the buyer.
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What is the effect on bargaining between Sally the seller and Burt the buyer?
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➢ Market for used cars.
➢ Two qualities: high quality and “lemons”.
➢ Sally knows the quality,
➢ but Burt doesn’t before buying, although Burt does know the proportion of “lemons.”

George Akerlof shared the 2001 Nobel for his work on markets with asymmetric information; he coined the “lemons” tag.
Adverse selection

- The risk of buying a “lemon” may deter buyers, unless the price is low enough.
Adverse selection

➢ The risk of buying a “lemon” may deter buyers, unless the price is low enough.
➢ And the proportion of “lemons” offered for sale may exceed the proportion in the population if the owners of good cars are deterred from offering them for sale since they command no premium over “lemons” because buyers cannot distinguish the two qualities.


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➢ This is an example of adverse selection.
Gresham’s Law rules, OK?

For the second-hand car market to exist, the price of cars must be:
Gresham’s Law rules, OK?

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Gresham’s Law rules, OK?

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**Gresham’s Law rules, OK?**

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- *A Gresham’s law of cars: the “lemons” drive out the good.*
  
  Originally: “Bad money drives out good.” How?
**Example: Second-Hand Car**

- 60% of a model “lemons,” as Burt knows but can’t distinguish.
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➢ Sally knows the quality of the car she’s selling (∴ asymmetric information).
What’s the price?

➢ First, there can be only one price since Burt can’t distinguish between “lemons” and good cars.
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➢ For risk-neutral Burt, pay up to $0.6 \times 1000 + 0.4 \times 2000 = 1400$, the expected value.

➢ If the market operates and potential Burts exceed the numbers of cars for sale, then this is the market price.
A separating equilibrium

Will the market operate if Burt offers $1400?
A separating equilibrium

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Will Sallys be willing to sell at $1400?
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The Market for Lemons with Separating. (B,S)

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Insurance markets and private information about health and longevity.
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Will insurance companies expect a disproportionate number of unhealthy people to be attracted? Consequences? (“Moral hazard.”)
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A pooling equilibrium
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But: Private information is not always a problem ...
Private information not always a problem:

What if there are fewer “lemons:” 40% instead of 60%?

➢ if the proportion of “lemons” is 40% and is common knowledge,

➢ then Burt will pay up to \(0.4 \times $1000 + 0.6 \times $2000 = $1600\), the expected value,
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∴
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∴ *A pooling equilibrium.*
A *pooling equilibrium* game tree.

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N
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B
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S
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Y
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Y
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N
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Offer expected value = \(0.4 \times 1000 + 0.6 \times 2000 = 1600\)

\((-600, 1000)\) \(0, 0\) \((400, 100)\) \(0, 0\)
A pooling equilibrium game tree.

The Market for Lemons with Pooling. (B,S)

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Asymmetric Information & the Sub-Prime Crisis

“.. nothing stopped the banks selling lemon bonds. Like used cars that break down right after they are sold, the seller could reduce the quality of the product and cut costs without the buyer’s knowledge. As low-quality products sell at the same price as high-quality products, the latter disappear from the market.

In capital markets, the information asymmetry between buyers and sellers of securities is even more extreme, making it hugely tempting for banks to issue securities to increase their expected profits by reducing the repayment probability below what buyers expect.”

— Hans-Werner Sinn, “Lemon Banking and the Subprime Crisis,” April, 2008. (Reading 24.)
Summary

Negotiation strategies depend on what information is public and what private.
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- Screening or Sorting. Strategies to defend yourself against another’s informational advantage, against adverse selection. (Sally’s pricing schedule)
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➢ Screening or Sorting. Strategies to defend yourself against another’s informational advantage, against adverse selection. (Sally’s pricing schedule)

➢ Signalling. Strategies to exploit your own informational advantage (Wally’s diploma & Betty)
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Negotiation strategies depend on what information is public and what private.

➢ Screening or Sorting. Strategies to defend yourself against another’s informational advantage, against adverse selection. (Sally’s pricing schedule)

➢ Signalling. Strategies to exploit your own informational advantage (Wally’s diploma & Betty)

Signalling is *credible communication* of private information. Signalling must not only cost you to undertake it, but the other party must know that your cost is higher if you’re misrepresenting yourself than if you’re being truthful.
Possible inefficient breakdown
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Bargaining under incomplete or asymmetrical information has a PD character: breakdown may occur with its attendant inefficiencies and dead-weight losses. Breakdown doesn’t imply irrationality in these circumstances.
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You may be able to induce the other party to reveal private information, thus overcoming your informational disadvantage:

- the opponent’s costs of delay or your lack of information over opponent’s limits may result in haggling;
- the cost of delay may reveal your opponent’s smallest acceptable share of the gains to trade, if you start by demanding a large share.
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Another way of reducing your informational handicap is to play one bidder off against another — using competition — to induce them to reveal at least part of what they know, see Bidding and Auction Design. (Lecture 18.)
Evidence of Signalling and Screening

- Insurance companies
- Venture capitalists
- Quality of durable goods
- Borrowing
- Health insurance
- Others?