# Signaling

## EC 350: Labor Economics

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# Signaling

**Q:** Why do college graduates earn more than high-school graduates?

- They learn new skills that increase your productivity?
- They separate themselves from people who couldn't make it through college?
  - Getting through may correlate with productive attributes.

## Asymmetric information

One side of a market often has less information than the other.

- In the labor market, employers often have to "take a chance" on new employees—they don't know exactly who is a good fit for a job.
- To separate those who would be a good fit for the job from those who wouldn't, employers can 1) rely on **signaling** by potential employees or 2) employ a **screening** test.

# Education as a signal of ability

The **Spence model**[†] posits that education can help higher-ability workers separate themselves from lower-ability workers when employers cannot directly observe ability.

- In contrast to models of human capital, the Spence model assumes that **education has no impact on productivity**.

**The players?**

1. High-ability workers
2. Low-ability workers
3. Employer
    - Willing to pay a premium for high-ability workers over low-ability workers.
    - But...unable to observe worker types.

[†] Named after the economist Michael Spence, who developed the model in Job Market Signaling, *The Quarterly Journal of Economics* (1973).

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**And their objectives?**

1. High-ability workers **want to separate** themselves from low-ability workers.
2. Low-ability workers **want to pool** with high-ability workers.
3. Employer **wants to identify** worker **types**.

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# Spence model

## Setup

If the employer could observe types, then they would pay a salary that corresponds to each individual's present value of lifetime productivity.

| Worker type | Proportion of population | Present value of lifetime productivity |
|---|---|---|
| Low-ability | $q$ | \$250,000 |
| High-ability | $1 - q$ | \$350,000 |

Workers know their ability, but the employer doesn't! $\longrightarrow$ **asymmetric information!**

# Spence model

## Pooling equilibrium

With asymmetric information, **the employer treats all workers the same**, paying an identical salary that averages the lifetime productivity of both groups:

$$\begin{aligned}\text{Salary} &= 250{,}000 \times q + 350{,}000 \times (1 - q) \\ &= 350{,}000 - 100{,}000 \times q\end{aligned}$$

- **Low-ability workers are overpaid** and **high-ability workers are underpaid**.
- **The employer also suffers** because workers are not necessarily assigned to the appropriate job.

**Q:** Why can't a high-ability worker just tell the employer that they are highly-able?

**A:** Because **talk is cheap!**

- A low-ability worker can just as easily claim that they are highly-able!

# Spence model

## Ability signaling

High-ability workers have an incentive to provide **a credible signal** of their ability to employers.

- If employers learn their type, then they get a higher wage.

Likewise, employers have an incentive to **extract signals** that separate workers by ability.

- Knowing worker types allows employers to **avoid mismatches** between workers and jobs.

**Q:** When is a signal *credible*?

**A:** When it is sufficiently **costly!**

- Costly enough to discourage low-ability workers from pursuing.
- Cheap enough for high-ability workers to willingly pursue.

# Spence model

## Separating equilibrium

Employers can choose a level of education $\bar{e}$ that separates low-ability types from high-ability types.

- Anyone with less education than $\bar{e} \longrightarrow$ low-ability.
- Anyone with $\bar{e}$ or more education $\longrightarrow$ high-ability.

The existence of a separating equilibrium **requires that education is more costly for a low-ability worker** than for a high-ability worker.

- Both types face the same tuition rates, book prices, *etc.*
- But low-ability types pay more in extra tutoring, re-taking failed classes, additional stress, *etc.*

Assume that low-ability workers pay \$30,000 per year and high-ability workers pay \$20,000 per year.

# Spence model

## Separating equilibrium

Employers can choose a level of education $\bar{e}$ that separates low-ability types from high-ability types.

- Anyone with less education than $\bar{e} \longrightarrow$ low-ability.
- Anyone with $\bar{e}$ or more education $\longrightarrow$ high-ability.

The low-ability worker **will not obtain** $\bar{e}$ if the low-ability wage exceeds the higher wage minus the cost of education:

$$\begin{aligned} 250{,}000 &> 350{,}000 - 30{,}000 \times \bar{e} \\ \bar{e} &> 3.33 \end{aligned}$$

# Spence model

## Separating equilibrium

Employers can choose a level of education $\bar{e}$ that separates low-ability types from high-ability types.

- Anyone with less education than $\bar{e} \longrightarrow$ low-ability.
- Anyone with $\bar{e}$ or more education $\longrightarrow$ high-ability.

The high-ability worker **will obtain** $\bar{e}$ if the high-ability wage minus the cost of education exceeds the low-ability wage:

$$\begin{aligned} 350{,}000 - 20{,}000 \times \bar{e} &> 250{,}000 \\ \bar{e} &< 5 \end{aligned}$$

# Spence model

## Separating equilibrium

Employers can choose a level of education $\bar{e}$ that separates low-ability types from high-ability types.

- Anyone with less education than $\bar{e} \longrightarrow$ low-ability.
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In our running example, the employer chooses $3.33 < \bar{e} < 5$, which separates high-ability from low-ability workers.

- High-ability workers get $\bar{e}$ years of education and earn a lifetime salary of $350,000.
- Low-ability workers get zero years of education and earn a lifetime salary of $250,000.

# Spence model

## Implications?

For the **role of education?**

- Under a pure signaling model, education is nothing more than a **sorting mechanism**.
- You professor's job? Make sure A's only go to high-ability students.

For **economic efficiency?**

- On the one hand, **education is "wasteful"** in the sense that it doesn't increase productivity.
- On the other hand, **education reduces worker mismatch** caused by asymmetric information.

# Spence model

## Implications?

For **you?**

- Taking difficult classes set you apart, *even if you don't learn anything*.
- Not all A's are created equal.
- Cheap talk on your résumé won't increase your odds of landing a job, at the margin.
  - You're a *detail-oriented, self-motivated, team player*? Sure.

# Sheepskin effects

The empirical relationship between earnings and years of education **isn't smooth**.

- There are significant **"jumps"** in average earnings **where you'd expect them**—12 years, 16 years, *etc.*[1]
- *Holding years of education constant*, workers with a degree earn more than those without a degree, on average.[2]

That is, the simple act of having obtained that piece of paper—your degree—seems to matter a lot.

**Q:** Does this provide evidence for signaling?

**A:** It's debatable, though the more-convincing arguments suggest that sheepskin effects are not evidence of pure signaling.

[1] Thomas Hungerford and Gary Solon (1987), Sheepskin Effects in the Returns to Education, *The Review of Economics and Statistics*.

[2] David A. Jaeger and Marianne E. Page (1996), Degrees Matter: New Evidence on Sheepskin Effects in the Returns to Education, *The Review of Economics and Statistics*.

# Signaling *vs.* human capital

## Discussion

**$Q_1$:** Why do I make you take exams?

**$Q_2$:** Why do we give gifts?

**$Q_3$:** What is the purpose of initiation rituals (*e.g.*, to join a gang)?

# Housekeeping

**Problem Set 3** due Sunday, **May 23rd** by 11:59pm PDT.

**Assigned reading for Monday:** Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination by Marianne Bertrand and Sendhil Mullainathan (2004).

- Reading Quiz 9 is due by **Monday, May 24th at 16:00**.
- The quiz instructions will include a reading guide.