Lecture 20: Compensation Based on Education

Compensation in Organizations

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From the perspective of a social planner, should people with more education be paid more?

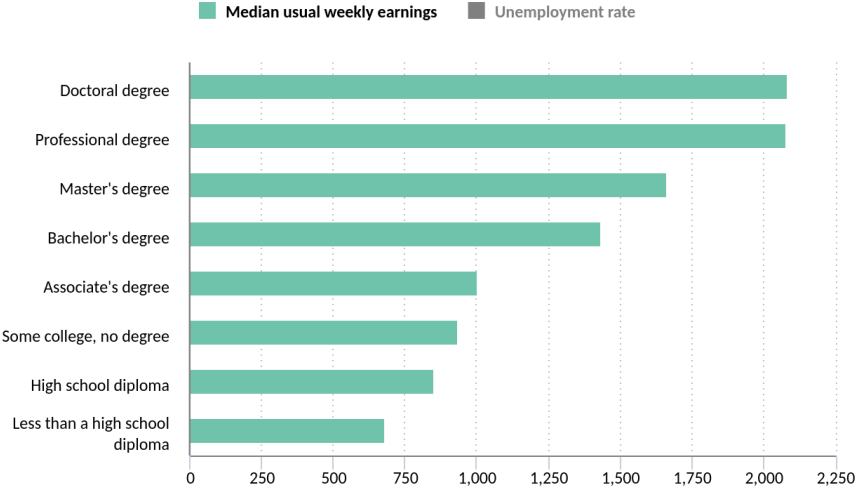From the perspective of an individual organization, should people with more education be paid more?

Blair and Chung (2022)

Aryal et. al. (2022)

Average Salary by Level of Education in the U.S.

Earnings and unemployment rates by educational attainment, 2022

Legend: ■ Median usual weekly earnings   ■ Unemployment rate

Why Are More Educated People Paid More?

► Selection: People who are more productive tend to get an education
  ► Education is not making them productive.

  ► Rather, it signals that they are already productive.

► Treatment: Education makes people more productive.

The Returns to Education

▶ Suppose we econometrically decompose a person's income:

$$\underbrace{I}_{\text{income}} = \beta \cdot \underbrace{E}_{\text{education}} + \underbrace{a}_{\text{latent productivity}}$$

▶ β is the return to education, and it is important for policymakers.

▶ Discussion: Why?

▶ You cannot typically just regress income on education, because education is correlated with latent productivity.

▶ This is exactly the selection effect we talked about on the last slide.

▶ There is an entire literature trying to estimate the returns to education (β).

But Wait...

- ▶ This class is about compensation within organizations.

- ▶ It is not about setting education policy. So what do we care about?

- ▶ Organizations care about hiring productive people.

- ▶ Whether education made them productive or they were productive prior to being educated is not the main concern.

- ▶ It can be a big concern if an organization pays members to go to school.

- ▶ Then knowing the return to education matters, because the org. is encouraging education directly.

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Removing the Return to Education

▶ It is relatively straightforward to think about how the returns to education works.

▶ If I learn to read, I can receive and follow directions.

▶ If I learn to prepare a centrifuge, I can work in certain types of labs.

▶ But suppose the return to education is 0.

▶ Does it still make sense for an organization to pay higher wages to more educated people?

▶ Thinking through this question also helps us ask when an organization should ever pay people based on an observable characteristic.

Model (Job Market Signaling)

▶ There is a single worker and two firms

▶ Worker is either high productivity ($t = H$) with prob. p or low productivity ($t = L$) with prob. $1 - p$.

▶ Profit from hiring low-skill is 0 and high-skill is $\pi > 0$

▶ First, the worker can acquire education $E = 1$ at cost c_t where $c_H < c_L$ (Why?) or not ($E = 0$) at cost 0.

▶ After observing education each firm posts a wage Bertrand style.

▶ After observing the wage, the worker chooses a firm. Assume the worker flips a coin when indifferent.

Model: Important Feature

▶ Importantly firms do not observe productivity.

▶ They do know the probability the person is high or low productivity.

▶ This is equivalent to knowing the fraction of the population that is each type.

▶ They also see education.

▶ We need to understand how beliefs change when a firm sees a high education person.

See the Board!

Solution

Theorem 1

The following are equilibrium outcomes under the assumption that $c_H < \pi < c_L$:

▶ *Only high productivity workers get an education*

▶ *No one gets an education, and firms believe those with an education have the same probability of being high productivity than those without.*

▶ *Everyone gets an education, and firms believe those without an education are low productivity.*

▶ It is clear that education can serve as a signal of productivity.

▶ This is true even when the return to education is 0.

Beliefs are Self-Confirming

▶ If firms believe educated people are productive, education becomes valuable.

▶ If firms believe educated people are no different than non-educated, education is worthless.

Education as a Costly Signal

- ▶ Notice that we needed the assumption that $c_H < \pi < c_L$

- ▶ The opportunity cost of education for high productivity people must be much less than for low productivity people.

- ▶ Discussion: Is this true?

- ▶ This is necessary for education (or anything) to be a signal.

- ▶ Analogy: advertising

- ▶ It allows productive people to separate themselves, because it is too costly for low productivity people to follow.

- ▶ As we discussed, it is not sufficient (we also need the right beliefs!)

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Aryal et. al. (2022)

- ▶ The authors call the total effect of education on wage the "private return."

- ▶ In our language this is the signaling effect plus the returns to education.
  - ▶ Key idea: if something shifts education that employers do not observe, we can uncover the private return!

  - ▶ Discussion: why?

- ▶ They call the returns to education (the direct productivity increase) the "social return."
  - ▶ Key idea: if something shifts education that employers do observe, we can uncover the social return!

  - ▶ Discussion: why?

A Natural Experiment

- ▶ Norway extended compulsory schooling from 7 to 9 years between 1960 and 1975.

- ▶ Crucially, it rolled out the program across the country slowly.

- ▶ Jobs are concentrated in the central cities, but workers come from across the country.

- ▶ For example, Oslo implemented the law in 1967 but surrounding areas implemented it as early as 1961 and as late as 1971.

- ▶ If you grew up in a central city, employers likely understood how the law impacted your schooling decisions.

- ▶ If you grew up in one of the many outlying regions, they likely did not.

A Natural Experiment

- ▶ We can analyze how the reform impacted wages of those who grew up in central regions to get the social return.

- ▶ We can analyze how the reform impacted wages of those who grew up in non-central regions to get the private return.

- ▶ Norway also has mandatory military service and thus administers an IQ test to males.

- ▶ So we can ask whether education could be a signal.

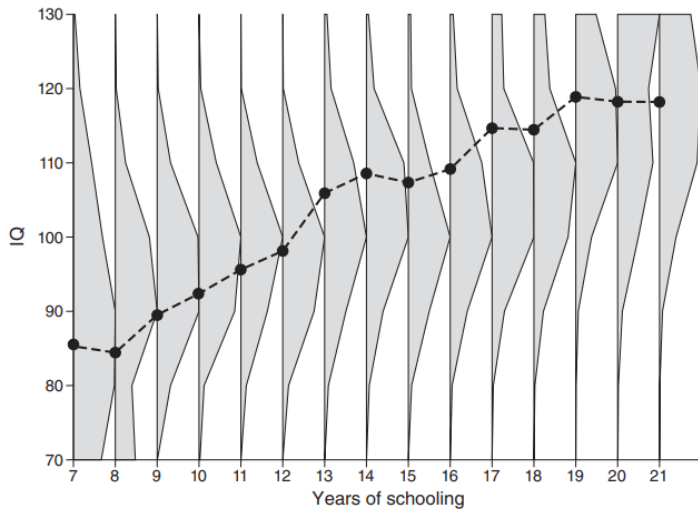# Should We Expect Signaling?

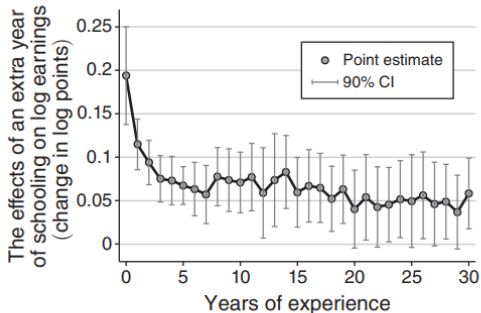FIGURE 1. CONDITIONAL PROBABILITY DENSITY OF IQ TEST SCORES ON SCHOOLING

Did the Law Increase Schooling?

TABLE 1—FIRST-STAGE ESTIMATES ON YEARS OF SCHOOLING

	Full sample (1)	Hidden IV sample (2)	Transparent IV sample (3)
Instrument			
Exposure to compulsory schooling reform	0.237	0.228	0.240
	(0.025)	(0.034)	(0.032)
Controls			
Municipality fixed effects	✓	✓	✓
Cohort fixed effects	✓	✓	✓
F-statistic (instrument)	87.7	45.7	55.5
Sample mean years of schooling	12.36	12.27	12.50
Standard deviation years of schooling	2.50	2.46	2.56
Number of observations	14,746,755	8,697,979	6,048,776

Did The Law Increase Wages?

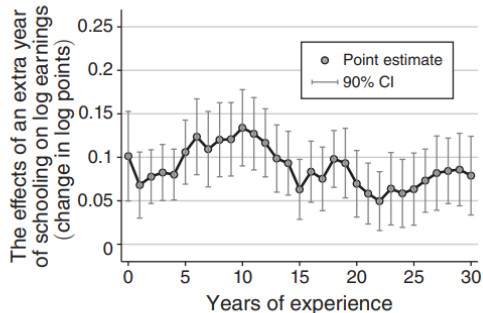Panel A. Hidden IV estimates   Panel B. Transparent IV estimates

FIGURE 3. HIDDEN AND TRANSPARENT IV ESTIMATES OF THE RETURNS TO SCHOOLING

Signaling and the Private Returns to Education

- ▶ The initial private return is 19.8 percent.

- ▶ But this value decreases rapidly to 5.5 percent as a worker is employed.

- ▶ Employers put only a 16.4 percent weight on the initial education signal from workers.

- ▶ Confirms an old adage: your degree matters most for your first job, then your first job matters.

The Returns to Education (Social Return)

- ▶ The social return is estimated to be 5.5 percent.

- ▶ The private return converges to the social return as signaling vanishes!

- ▶ Bottom-line: the authors estimate that of the total wage return to education, 70 percent is a productivity increase from education while 30 percent is signaling.