Lecture 8: If the return to education is real, does it reflect skills learned or is it a signal?

Signaling:

Assume there are two perspective employees in the economy, high ability, H_1, and low ability, L_0, workers.

$$MPL_{H1} = w_{H1} = 2$$
$$MPL_{L0} = w_{L0} = 1$$

Employers want to assign employees to jobs based on years of education. Why? Because educational attainment is correlated with ability and the cost of education is lower for high ability workers.

For y years of education:
H_1 ability workers pay \$y/2 per year of schooling
L_0 ability workers pay \$y per year of schooling

Why signal are we looking for? The employer will announce some rule such as to get an H_1 job, an employee must have years of schooling greater than or equal to y^*.

If $y^*=3$, how much schooling will people get?
Some people will get 0 years of schooling while others will get exactly 3 years of schooling.

One period model:

We want to find a separating equilibrium where H_1 workers get y^* years of schooling and L_0 workers get 0 years of schooling. Therefore we need high enough so that the low ability workers won't get y^* years of schooling and sneak into the high ability group of workers.

The low ability workers compare the following:
No school---
$$w = 1 = w_{L0}$$
School---
$$w = w_{H1} - (EducationCost) = 2 - y^*$$

For the screening rule to work:
$$1 > 2 - y^*$$
$$y^* > 1$$

L_0 workers will not get y^* if $y^* > 1$

The high ability workers compare the following:
No school---
$$w = 1 = w_{L0}$$
School---

$$w = w_{H1} - (EducationCost) = 2 - \frac{y^*}{2}$$

For the screening rule to work:

$$1 > 2 - \frac{y^*}{2}$$

$$y^* < 2$$

H_1 workers will get y^* if $y^* < 2$

The separating equilibrium will occur if $1 < y^* < 2$, where H_1 workers get y^* years of education and L_0 workers get 0 years of education.

One key assumption we have made is that education is unproductive and only acts to sort workers into high and low ability groups.

What if education cost the same for all workers?
The low ability workers will obtain no schooling if $y^* > 1$.
The high ability workers will obtain y^* years of schooling if $y^* < 1$.
The model doesn't work if the cost of education isn't correlated with ability.

Signals include education----things which you can buy.
Indices include race, neighborhood you grew up in, and age----things that you can't buy or alter.

Say you have the following information:
A minority student from a bad neighborhood---this is index information.
What effect would that information have on an employer hiring decision? Most likely, negative.
How do we model this? The employer might equate y years of schooling on a resume from a minority candidate with 0.8y effective years of education. This lowers the rate of return to schooling for people with that index. Each additional year of schooling is worth less for a minority student than for a white student. Minority students are less likely to go to school or will go to school less than their white counterparts. This is the case of a self-fulfilling prejudice because of the feedback mechanism in the model.
Example: The movie *Stand and Deliver* followed a newly initiated AP calculus class in a poor California neighborhood. When the students scored well on the AP test, people initially assumed that they had cheated. After it was proved that they did cheat, people took the high scores on the AP Calculus exam as a signal that the students were intelligent.

The Lemons Problem:
Say we have a 1999 Ford Taurus with 78,000 miles that we want to sell. How would we find out the value? Go to Kelley Blue Book online and look it up. Or use a local area market source where people advertise.

KBB.com info:
If the car is a creampuff (in good condition): $4025
If the car is a lemon (in poor condition): $2500

Expectation: The proportion of lemons in the market is p=0.50.
Are there signals in this market? Not really. You could try taking a used car you were interested in to a mechanic. If the owner says no, you have a signal that the car is in bad condition.

Round 1: The expected value of the car= 0.5(4025)+0.5(2500)=3262.50
If you have a lemon, selling your car at $3262.50 is a great deal.
If you have a creampuff, you don't want to sell your car at this price.

Round 2: There will be fewer creampuffs on the market and more lemons so the expected price that customers are willing to pay decreases.

Overtime, this market breaks down because there are no good signals. The market is driven to a point where only lemons are sold because of asymmetric information.

Similarly, if your education isn't taken seriously because of indices, word will spread that the value of education for a person with negatively perceived indices is lower, and these people will get less education.

Tyler, Murnane and Willet Paper: Testing the signaling value of a GED.

How do you test whether signaling really exists in the market?
You could compare the wages of people with equal cognitive abilities, some with a GED and some without. Unfortunately, standard datasets do not usually have a measure of ability, which we have already learned contributes to a person's wages.

We need:
  1) People with equal test scores
  2) Some of whom have the signal, some of whom don't

Argument: These people are identical, except for the signal. Does the signal get you anything in terms of wages?

What is the GED? A high school equivalency test consisting of a battery of 5 tests-1 written essay and 4 multiple-choice sections.

	1975	**1988**	**1992**	**1996**
Total	83.6	84.5	86.4	86.2
Fraction of young adults competing HS	---	80.3	81.2	76.5
Faction of young adults completing the GED or some alternative	---	4.2	5.2	9.8

What does it take to pass the GED?
The national office defines passing as a minimum score of 40 on each of the 5 tests or a mean score of at least 45. If that was it, are there useful tests that we can run? Assuming uniform national standards:

$$\ln(wage)_i = \alpha_0 + \beta_1(avgtestscore)_i + \beta_2(GED)_i + \mu_i$$

$(GED)_i = 1$ if person i has a GED, 0 otherwise. We have a problem of selection bias in pools of those with GEDs and those without GEDs. β_1 and β_2 can't be separated. This is a case of extreme multi-colinearity.

However, states have the right to impose standards stricter than the national standards and some do. Therefore, we can have 2 people with the same GED scores, 1 in one state with a GED and 1 in another state without a GED.

There are 3 groups:
1) A minimum of 40 or a mean score of at least 45
2) A minimum score of 35 AND a mean score of at least 45
3) A minimum score of at least 40 AND a mean score of at least 45

	Mean Score	
Minimum Score	**< 45**	**>45**
20-34	1	
35-39	2	4
40-44	3	5
45-46		6
47-48		7
49-50	8	
51-52	9	
53+	10	

People in groups 1 and 2 do not receive a GED in any state. People in groups 5-10 receive GED's in any state. Groups 3 and 4 are our groups of interest because people with these scores would receive scores in some states and not in others.

Take people only from group 4, across all states.

$$\ln(wage)_i = \alpha_0 + \beta_1(GED)_i + \mu_i$$

$(GED)_i = 1$ if person i has GED, 0 otherwise

Does =the impact of GED of wages? Not necessarily. Wage levels may differ across states for reasons other than having or not having a GED.
Solution: Use the differences-in-differences method.

Experiment:
Use data from treatment states that award GEDs to those in groups 4 and higher and control states that award GEDs to those in groups 5 and higher.

	States	
	Treatment	**Control**
Group 4	A	B
Groups 5-10	C	D

(A-B)= the GED effect + the state economy effect
(C-D)= the state economy effect
(A-B)-(C-D)= the GED effect alone

In the paper, this differences-in-differences calculation in done separately for whites and minorities.

For white males:

	States	
	Treatment	**Control**
Group 4	9628	7849
Groups 5-10	9981	9676

(A-B)= 1779
(C-D)= 305
(A-B)-(C-D)= 1473, standard error of 673

Conclusion: The GED does have a signaling effect for white males.