Estimating Marginal Returns to Education

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Questions

- Does the pursuit of compareative advantage increase or decrease earnings in equality within sectors and in the overall economy?
- Do the people with the highest i skill actually work in sector i?
- As people enter a sector in response to an increase in the demand for its services, does the average skill level employed there rise or fall?

The proportion of the population working in sector one P_1

$$P_1 = \int_0^{\infty} \int_0^{\pi_1 s_1/\pi_2} f(s_1, s_s) ds_1 ds_2$$

The density of skills employed in sector one differs from the population density of skills.

$$f(s_1) = \int_0^{\infty} f(s_1, s_2) ds_2$$

$$g_1(s_1 \mid \pi_1 S_1 > \pi_2 S_2) = \frac{1}{P} \int_0^{\pi_1 s_1/\pi_2} f(s_1, s_2) ds_2$$

The distribution of skills employed in sector i differs from the population distribution of skills due to comparative advantage.

Wage Equations

$$\log W_1 = \log \pi_1 + \mu_1 + U_1$$
$$\log W_2 = \log \pi_2 + \mu_2 + U_2,$$

where $U_i = \log S_i - \mu_i$.

The Generalized Roy Model

Potential Outcomes	Cost	(1)
$Y_1 = \mu_1(X) + U_1$	$C = \mu_D(Z) + U_C$	(2)
$Y_0 = \mu_0(X) + U_0$		(3)
		(4)
Observed Outcomes	Choice	(5)
$Y = DY_1 + (1 - D)Y_0$	$S = Y_1 - Y_0 - C$	(6)
	$D = \mathrm{I}[S < 0]$	(7)
		(8)

Mapping Notation to original Roy Model

Potential Outcomes	Cost	
$W_1 = \pi S_1$	$C = 0$	(9)
$W_2 = \pi s_1$		(10)
		(11)
		(12)
Observed Outcomes	Choice	(13)
$W = DW_1 + (1 - D)W_2$	$S = W_1 - W_2$	(14)
	$D = \mathrm{I}[S < 0]$	(15)
		(16)

Extended Roy Model

Potential Outcomes	Cost	
$Y_1 = \mu_1(X) + U_1$	$C = \mu_D(Z)$	(17)
$Y_0 = \mu_0(X) + U_0$		(18)
		(19)
		(20)
Observed Outcomes	Choice	(21)
$Y = DY_1 + (1 - D)Y_0$	$S = Y_1 - Y_0 - C$	(22)
	$D = \mathrm{I}[S < 0]$	(23)
		(24)

Appendix

References

Carneiro, P., Heckman, J. J., and Vytlacil, E. J. (2011). Estimating marginal returns to education. *American Economic Review*, 101(6):2754–2781.