Erasmus School of Economics

MOOC Econometrics

Lecture 2.1 on Multiple Regression: Motivation

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Introduction

- Compare wage of males and females.
- They may differ, for example, in education level.
- Research Question 1: What is total gender difference in wage, including differences caused by education?
- Research Question 2: What is partial gender difference in wage, excluding differences caused by education?

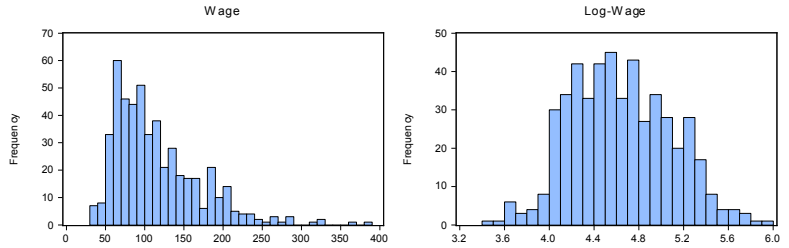
Gender difference in wage

Test

- For which question should education be included in the analysis?
- For which question should it be excluded?

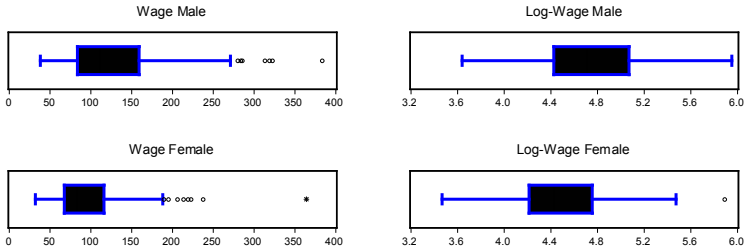
- Total gender effect including education effects:
  → Education should be excluded from model!
- Partial gender effect excluding education effects:
  → Education should be included in model!
- Coming lectures will explain the why and how.

Wage data set



- Data set for 500 employees on wages (indexed, median = 100).
  → Random sample from much larger population of employees.
- Wage is much more skewed than log-wage
  ('log' denotes natural logarithm).

Boxplots of wage and log-wage



- Females have lower wage than males.
- Research questions:

  → How large is this difference?

  → What are the causes of this difference?

Simple regression

- $\log(\text{Wage}) = 4.73 - 0.25\text{Female} + e$

  $(R^2 = 0.07,\ b = -0.25,\ t_b = -6.25)$

- 'Female': gender dummy, 1 for females, 0 for males.

Test

What is the estimated gender difference in wage level?

- Answer: $\log(\text{Wage}_{Female}) - \log(\text{Wage}_{Male}) = -0.25$

  $\text{Wage}_{Female} = \text{Wage}_{Male} \times e^{-0.25} = \text{Wage}_{Male} \times 0.78$

  → Females earn on average 22% less than males.

Multiple explanatory factors

- Wage depends on factors as age, education level, and part-time jobs.
- Simple regressions give:

$$\begin{aligned} \text{Age} &= 40.05 - 0.11\text{Female} + e && (R^2 = 0.00, t_b = -0.11) \\ \text{Educ} &= 2.26 - 0.49\text{Female} + e && (R^2 = 0.05, t_b = -5.16) \\ \text{Parttime} &= 0.20 + 0.25\text{Female} + e && (R^2 = 0.07, t_b = 6.15) \end{aligned}$$

- Females: same age, lower education, more often part-time job.

Gender differences in education

		Education level				
		1	2	3	4	Total
Count	Male	108	77	72	59	316
	Female	88	57	33	6	184
Percentage	Male	34	24	23	19	100
	Female	48	31	18	3	100

Gender differences in part-time jobs

		Part-time job		
		Yes	No	Total
Count	Male	62	254	316
	Female	82	102	184
Percentage	Male	20	80	100
	Female	45	55	100

Partial effects

- Partial effect: if all other variables remain 'fixed'.
- Research question: What is partial gender effect on wage?
- So: Gender difference in wage after correction for differences in education and part-time jobs.
- Answer obtained by multiple regression.
  - → Methods: Lectures 2.2-2.4
  - → Outcomes: Lecture 2.5

TRAINING EXERCISE 2.1

- Train yourself by making the training exercise (see the website).
- After making this exercise, check your answers by studying the webcast solution (also available on the website).