

**PRELIMINARY EXAMINATION FOR THE Ph.D. DEGREE**

---

**Q1.** The ratio of the 90<sup>th</sup> percentile wage to the 10<sup>th</sup> percentile wage is a common measure of earnings inequality.

- a) Use the diagram below to roughly show (draw) how this measure has changed over time.



- b) Researchers have described a number of possible explanations for the earnings inequality patterns that have been observed over the past half century. The two leading explanations are 1) changes in technology, and 2) changes in institutions. Briefly summarize these two explanations, being sure to explain why they might contribute to changes in inequality.
- c) Some researchers have tried to disentangle the relative importance of technology vs. institutions by focusing on changes in “within group” earnings inequality. What do we mean by “within group” inequality in this context, and how can changes in within group inequality provide clues about the factors that are contributing to changes in earnings inequality over time?
- d) Lemieux (2006) investigates how changes in within group inequality have been affected by changes in the composition of workers by estimating the following equation:

$$V_t = \sum_j \theta_t(j) V_t(j)$$

where  $V_t$  is the total earnings variance in year  $t$ ,  $V_t(j)$  is the earnings variance in year  $t$  for group  $j$ , and  $\theta_t(j)$  is the share of the workforce in group  $j$ . Since we would expect  $V_t(j)$  to be bigger for older, more educated workers, and the US population has been getting both older and more educated, part of the change in overall inequality over time might result from the fact that groups with bigger earnings variance are contributing more weight to the overall inequality measure. What does Lemieux find when he investigates this possibility and how

does it affect his conclusions about the factors behind the changes in inequality that we have observed over the past half century?

- e) What counter-evidence is there that changes in inequality over time have *not* mostly been driven by changes in institutions? If it is helpful, you can specifically draw on Autor, Katz and Kearney (2008).

**Q2.** Suppose that you are interested in estimating the effect of class-size on children's test scores. You have a dataset that includes test scores for all public school children in state A, along with information about each child's race, gender, and whether he/she is eligible for the free/reduced price school lunch program. The dataset also includes student, school and grade identifiers. It contains test score information covering a period from 1995-2005.

- a) One approach to estimating the effect of class-size on children's test scores would be to run an OLS regression. How would you implement this estimation strategy? Include a regression equation and a detailed description. What critical assumptions are needed in order for OLS to yield unbiased estimates of the causal impact of interest? What are some weaknesses associated with this strategy?
- b) An alternative estimation approach that has been used by Caroline Hoxby (and others) is based on class-size variation across cohorts. Describe how you would implement this strategy, including a regression equation. What critical assumptions are needed in order for this strategy to yield unbiased estimates of the causal impact of interest? What are some strengths and weaknesses associated with this strategy?
- c) A third estimation approach, which has been used by Hanushek, Rivkin and Kain, uses variation within cohorts over time. Using a regression equation, describe how you would implement this strategy. What critical assumptions are needed in order for this strategy to yield unbiased estimates of the effect of class-size? What are some strengths and weaknesses associated with this strategy?
- d) A class-size reduction policy was implemented in California in the late 1990s. The policy gave schools strong financial incentives to keep grades K-3 pupil/teacher ratios below 20. The policy was put into place very suddenly, and so it was not anticipated. How could you use your data and the policy change to estimate the effect of class-size on student achievement?

**Q3.** Between 2000 and 2004, the Austrian government began a series of reforms to their mandated severance pay requirements. Austrian firms are required to provide payments to workers (as a function of their current pay and years of service at the firm) if they are dismissed from the firm. The reforms reduced these payments at most years of service, though the amount of the reduction varied across workers with different years of service. Under the old system, payments were constant over small ranges of years of service. Under the new system, payments increase continuously with years of service.

- a. Researchers using firm-level data on the level of employment and output of Austrian firms have estimated the following equation, separately on data from before the reform and after the reform.  $L_t$  represents total employment at the firm in year  $t$ ,  $Y_t$  is a firm-level measure of output. Optimal employment demand in the absence of adjustment costs is modeled as  $L_t^* = c_0 + c_1 Y_t + e_t$

$$L_t = a_0 + a_1 Y_t + a_2 L_{t-1} + e_t \text{ (before reform)}$$

$$L_t = b_0 + b_1 Y_t + b_2 L_{t-1} + e_t \text{ (after reform)}$$

- i. What is the meaning of the estimated coefficients  $a_2$  and  $b_2$ ?
  - ii. What is your hypothesis about the estimates of  $a_2$  and  $b_2$  given the severance pay reforms? Briefly explain your reasoning.
  - iii. Suppose the researchers had only industry-level aggregated data, and estimated the same equations using industry employment and output totals. What would you expect to happen to the estimates of  $a_2$  and  $b_2$ ?
- b. The table below summarizes the level of severance pay, at different years of service before and after the reforms. Suppose you are interested in estimating the effect of the reforms on the extent of employment volatility over the business cycle in Austria. You have access to firm-level data that gives total employment for each month; the total number of hires each month; and the total number of workers fired each month by the workers' years of service with the firm. Data are available for each month from 1990 to 2008. The reforms began in 2000, and were phased in gradually through 2004.

Outline the empirical approach you would take to estimate the effect of the reforms on employment volatility. Provide as much detail as possible on the specific econometric specification you would use, and how the reform effects would be identified.

Years of service interval	Old Severance Payment (constant throughout years of service interval)	New Severance Payment (amount at beginning of years of service interval)*
< 3 years	\$0	\$0
3-<5 years	2 months pay	1 month pay (increasing gradually to 1.5 months pay at 5 years)
5-<10 years	3 months pay	1.5 months pay (increasing gradually to 2 months pay at 10 years)
10-<15 years	4 months pay	2 months pay (increasing gradually to 3 months pay at 15 years)
15-<20 years	6 months pay	3 months pay (increasing gradually to 4.5 months pay at 20 years)
20-<25 years	9 months pay	4.5 months pay (increasing gradually to 6 months pay at 25 years)
25+ years	12 months pay	6 months pay (increasing gradually to maximum of 12 months pay at 37 years)

**Q4.** Pistaferri opens his 2003 paper on the intertemporal labor supply effects of wage changes with the following:

“A long-standing question in labor economics is whether and to what extent individual labor supply responds to anticipated wage changes (also known as evolutionary wage changes). This effect is measured by the intertemporal elasticity of substitution...”

- a. Why is it important that wage changes used to identify the intertemporal labor supply elasticity use only anticipated changes in wages? Discuss the expected sign of the labor supply response to anticipated wage changes. If some of the wage changes are unanticipated, what will be the likely effect on the estimated labor supply response? Why?
- b. Pistaferri (2003) has data on individual's subjective expectations of their future wage growth, which he utilizes to decompose observed wages into three components:
  - a. Anticipated, evolutionary movements in the wage over individuals' lifecycles
  - b. Unanticipated permanent shifts in the future profile of wages
  - c. Unanticipated transitory changes in wages

Describe the expected effect of each of these components of wages on an individual's labor supply, drawing on standard models of utility maximization (leisure and consumption choice) over the lifecycle.

- c. Pistaferri's preferred estimate of the intertemporal labor supply elasticity for men (based on his measure of anticipated movements in the wage) is approximately 0.7. Compare this with the range of estimates of the intertemporal labor supply elasticities presented by MaCurdy (1981) or Altonji (1986). What might be responsible for differences in the estimates across these authors? What does it suggest about interpretation of the within-person relationship between labor supply and observed wages?

**Q5.** Use this question to demonstrate your knowledge about empirical methods in Labor Economics. For each part, be as precise and comprehensive as possible.

You are trying to measure the causal impact of college education on labor market outcomes. As an initial specification, you estimate with OLS, including a dummy variable for "College Graduate" as well as several control variables. Your focus is on the coefficient on College Graduate. You have data on many sets of siblings; where for each person you know their education level, labor market outcomes, who is related to whom, and each individual's covariates.

- A. Describe the "standard reasons" why we should be concerned about biased coefficients from estimating by OLS.
- B. What problems with OLS will propensity-score matching help to solve? What problems will it not help to solve?

A colleague suggests adding "family fixed effects" to your specification.

- C. In what key ways does this change the nature of the identifying variation?
- D. What types of biases do family fixed effects help to remove?
- E. What are some ways that this strategy could still lead to biased results?
- F. Are there reasons why this strategy could increase the bias? Describe why or why not.
- G. What are the reasons why this strategy might not lead to biased estimates, but still give different results than OLS estimates?

For this last part of the question, put aside issues of biased coefficients. You are concerned about statistical inference, and consider bootstrapping.

H Describe as carefully as possible how you would implement this. What exact steps would you take? (Note: do **not** describe the Stata command(s) you would use. Instead, describe the conceptual steps involved.)

I. If you decide to not bootstrap, what would you do to get correct statistical inference?