14.661 Labor Economics Fall 2024 Practice Final Exam

Instructions. Read the entire exam first. The exam consists of two parts. Answer all the short questions (40 points) and two out of three long questions (60 points).

Please use a separate blue book for the short questions and for each of the long questions, for a total of three blue books.

Part I: Short Questions

[Please answer all eight questions. Each question is worth five points.]

- (a) Explain how a binding minimum wage may improve (utilitarian) welfare in a scenario in which it reduces overall employment. [Hint: think of heterogeneous effects].
- (b) Briefly describe the sort of natural experiment that might generate data that can be used to estimate a Frisch (intertemporal substitution) elasticity
- (c) When does it make sense to control for industry in a Mincer-type wage equation?
- (d) The fact that states with more generous welfare programs have more people on welfare implies that generous transfer programs promote welfare dependence. True, false or uncertain?
- (e) Workers change fewer jobs, have greater losses (smaller gains) conditional on separation, and have flatter age earning profiles in the German labor market than in the US labor market. These facts imply that the German labor market is less efficient than the US market. True, false or uncertain?
- (f) Firms that pay for their worker's general training are behaving irrationally. True, false or uncertain?
- (g) The fact that, within firms, one workers' educational attainment is highly correlated with that of his or coworkers implies that worker skills are complementary. True, false or uncertain?
- (h) Suppose education does not boost productivity but merely signals ability. Explain how, even so, the fact that some workers pay for schooling may improve the overall allocation of resources. [Hint: consider a setting in which there are different types of firms with different demands in terms of worker ability. Spell out the assumptions you need for this setting to generate social value from education signaling].

Part II: Long Questions

[Please answer two out of three of the following questions. Each long question is worth 30 points.]

Question 1:

Suppose aggregate output is given by F(L, H, K), where L is unskilled labor, H is skilled labor, and K is capital. Production function F exhibits constant returns to scale. Suppose also that the capital stock of the economy is fixed in the short run but may adjust in the medium run. Denote the labor supply of low-skilled worker by $S_L(w_L)$, the labor supply of high-skilled worker by $S_H(w_H)$ and the supply of capital by $S_K(r)$. I_L new immigrants arrive. They are unskilled and perfectly substitutable for native unskilled workers. You may use graphs or formulas to analyze the consequences of this inflow.

- (a) Describe the short-run impact of this increase in immigration on the wages and employment of domestic high-skilled workers and domestic low-skilled workers. What's the effect of immigration on the return to capital?
- (b) Discuss how the magnitude of these changes depends on the elasticity of labor supply of domestic lowskilled workers and on the elasticity of labor supply of immigrant workers.
- (c) Show that, in the short run, immigration increases US output but may increase or decrease US output per capita (including the immigrants)?
- (d) Explain why and in what way the impact of immigration on medium run output per capita depends on the medium-run elasticity of capital supply. [No need to do detailed mathematical analysis here].
- (e) How does minimum wage affect your conclusions? (Suppose this is binding for unskilled workers but below the skilled wage). How does this change your answers to 1-3?
- (f) A congressman proposes an "immigrant subminimum" (which allows firms to pay immigrants at a lower minimum wage). How does this change your answer to part 4?
- (g) In her 2008 JPE paper, Patricia Cortes argues that low-skilled immigration reduces the prices of immigrant-intensive non-tradable goods and services without affecting the wages of low-skilled natives (much). What is Cortes' explanation for this combination of findings? (Come up with your own if you don't recall hers).
- (h) Explain how Cortes' reasoning can be integrated with the above analytical framework.
- (i) Recall Card (1990). Imagine this sort of diffs-in-diffs analysis applied to local labor markets (while output is still determined by the function F at the national level). When will this strategy correctly identify the short-run impacts of immigration on domestic unskilled and skilled workers? When will it go wrong?

Part II: Long Questions Question 2:

Suppose that a worker's productivity is f(h, s), where h is her general human capital, s is her firm-specific human capital, and $f(\cdot, \cdot)$ is strictly increasing in both of its arguments, continuous, differentiable and concave. If the worker quits her current employer, she receives an outside wage of v(h) = f(h, 0). The wage with the current employer is determined by Nash bargaining where the worker's bargaining power is β .

- (a) Suppose that the worker's firm-specific human capital is fixed at s = 0, and the firm, and only the firm, can invest in the worker's general human capital h at the cost c(h), where $c(\cdot)$ is continuous, differentiable and convex, and satisfies c'(0) = 0. Determine the equilibrium level of general human capital.
- (b) Suppose now that there is firm-specific human capital, s > 0, and also that $f(h, s) = f_1(h) + f_2(s)$. Determine the equilibrium level of general human capital in this case.
- (c) Suppose next that s > 0, and $\partial^2 f(h, s)/\partial h \partial s > 0$. Determine the equilibrium level of general human capital in this case and compare it to those in parts 1 and 2. Carefully explain why the result is different in this case.
- (d) What is the effect of β on the level of general human capital investment in the previous part?
- (e) Suppose now that the worker invests in her own firm-specific human capital with cost function $\gamma(\cdot)$, which is assumed to be continuous, differentiable and convex, and satisfies $\gamma'(0) = 0$. Investments in the two types of human capital are undertaken simultaneously. Determine the equilibrium level of general human capital investment in this case.
- (f) Show that in part 5, a higher level of β can increase the equilibrium level of general human capital investment. Provide an intuition and contrast this result to part 4.

Part II: Long Questions Question 3:

Consider a search model in continuous time, with both workers and firms risk neutral as in the standard setup. Matches take place according to a constant returns to scale matching function M(U, V), and as usual, denote the flow job finding rate by $\theta q(\theta)$, where $\theta = V/U$ is the labor market tightness.

Suppose also that all workers are ex ante identical, but worker-firm matches are either good or bad. Whether a match is good or not is not observed by the employer or the worker, and they both engage in learning. Suppose that a good match produces flow output y at each instant at the flow rate λ , while a bad match never produces output (so in this model the only news is good news). Denote the common belief (posterior) of both the firm and the worker that the match is good at time t by μ_t . Suppose that

$$w_t = \beta \mathbb{E}_t \text{output} = \mu_t \lambda \beta y,$$

where $\beta \in (0, 1)$. Denote the prior that the worker-firm match is bad at the beginning of the relationship by μ_0 . There is no exogenous separation between firms and workers, but there could be endogenous separations. Assume that the worker when unemployed receives zero income.

- (a) Write down Bellman equations for the value of an unemployed worker, an employed worker, a firm with an open vacancy and a firm with a worker. Note that the Bellman equations for employed worker and firm with worker have to be functions of the belief that the match is good.
- (b) Show that there exists a threshold value $\mu^* < 1$ such that when beliefs fall below this value, the match will be destroyed.
- (c) Explain (without doing the math) how the wage path of a worker will evolve during her tenure. Is the wage of the worker increasing as a function of tenure conditional on staying on the job?
- (d) Consider the wage of a worker just before she quits her job and then her wage just after she gets a new job. Which one is higher?
- (e) Now contrast this model with the following variant. A good match generates output y at each instant, while a bad match also generates the same output at each instant, but with a flow rate η , it additionally produces a loss of -Y (so in this model the only news is bad news). Consequently, the wage now is

$$w_t = \beta [y - (1 - \mu_t)\eta Y].$$

How will the wage of the worker evolve during her tenure? Contrast this to the model with only good news.

- (f) How does the wage of the worker just before she quits her job and her wage just after she gets a new job compare? Which one is higher? Compare this to part 4.
- (g) Can both models generate wage losses after job loss? How does the answer to this depend on the tightness of the labor market, θ ?

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