ECON 115 - Labor Economics
Drake University, Spring 2024
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EXAMINATION 2 VERSION A
"Equilibrium and Differences in Pay"
April 4, 2024

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators, calculators with alphabetical keyboards, computers, wireless devices and mobile phones are NOT permitted. Point values for each question are noted in brackets. Maximum total points are 100.

I. Multiple choice: Please circle the one best answer to each question. [1 pts each, 16 pts total]

(1) In a simple model of a competitive labor market, in equilibrium,
a. the wage is zero.
b. the employment quantity is zero.
c. total surplus is zero.
d. unemployment is zero.

(2) A competitive labor market
a. divides the surplus equally between employers and workers.
b. maximizes the total surplus.
c. maximizes employer surplus.
d. maximizes worker surplus.

(3) Among U.S. states, those states with the lowest average wage a century ago have seen the
a. slowest subsequent wage growth.
b. fastest subsequent wage growth.
c. the same wage growth as other states.

(4) Suppose in a particular labor market, the elasticity of labor supply is 0.1 and the elasticity of labor demand is -0.8. If a payroll tax is enacted,
a. employers will bear most of the burden.
b. workers will bear most of the burden.
c. the burden will be shared equally between workers and employers.
d. the side of the market that is legally required to pay the tax will bear most of the burden.

(5) Long-run models of immigration predict that immigration will have little effect wages in the long run, because
a. long-run labor supply is perfectly elastic.
b. long-run labor supply is perfectly inelastic.
c. long-run labor demand is perfectly elastic.
d. long-run labor demand is perfectly inelastic.

(6) "Monopsony" means a market with a
a. single seller.
b. single buyer.
c. single buyer and a single seller.
d. single price.

(7) Marginal labor cost is defined as
a. the wage of the marginal worker.
b. the change in total labor cost when one more worker is hired.
c. the change in total labor cost when one more unit of output is produced.
d. the cost of hiring low-quality workers.

(8) If a firm's labor supply curve slopes up, then marginal labor cost is the wage of the marginal worker plus
a. the price of output.
b. the increase in wages for all other workers already employed.
c. that worker's value of marginal product.
d. the price of capital.

(9) A "non-compete" agreement is
a. an agreement among employers not to compete for workers.
b. an agreement among workers not to compete for jobs.
c. an agreement between an employer and a worker that the worker will not work for another employer in the same industry after leaving this job.
d. an agreement between an employer and a worker to settle disputes amicably.

(10) Anna currently works at a safe job and is paid $15 per hour. Anna is willing to switch to a risky job if she is paid at least $25 per hour. Anna's reservation price for the increased risk is
a. $5 per hour.
b. $10 per hour.
c. $15 per hour.
d. $20 per hour.
e. $25 per hour.

(11) Consider a diagram with wages on the vertical axis and risk of injury on the horizontal axis. If risk of injury is costly to reduce, then firms' isoprofit curves
a. slope down.
b. slope up.
c. are horizontal.
d. are vertical.

(12) Consider a diagram of hedonic equilibrium with the wage on the vertical axis and risk of injury on the horizontal axis. At any point on the hedonic wage function, the slope equals
a. the slope of some worker's indifference curve.
b. the slope of some employer's isoprofit curve.
c. Both of the above.
d. None of the above.

(13) Each worker's best choice for a job is at
a. the intersection between the worker's indifference curve and the hedonic wage function.
b. a tangency between the worker's indifference curve and the hedonic wage function.
c. the lowest possible point on the hedonic wage function.
d. the highest possible point on the hedonic wage function.

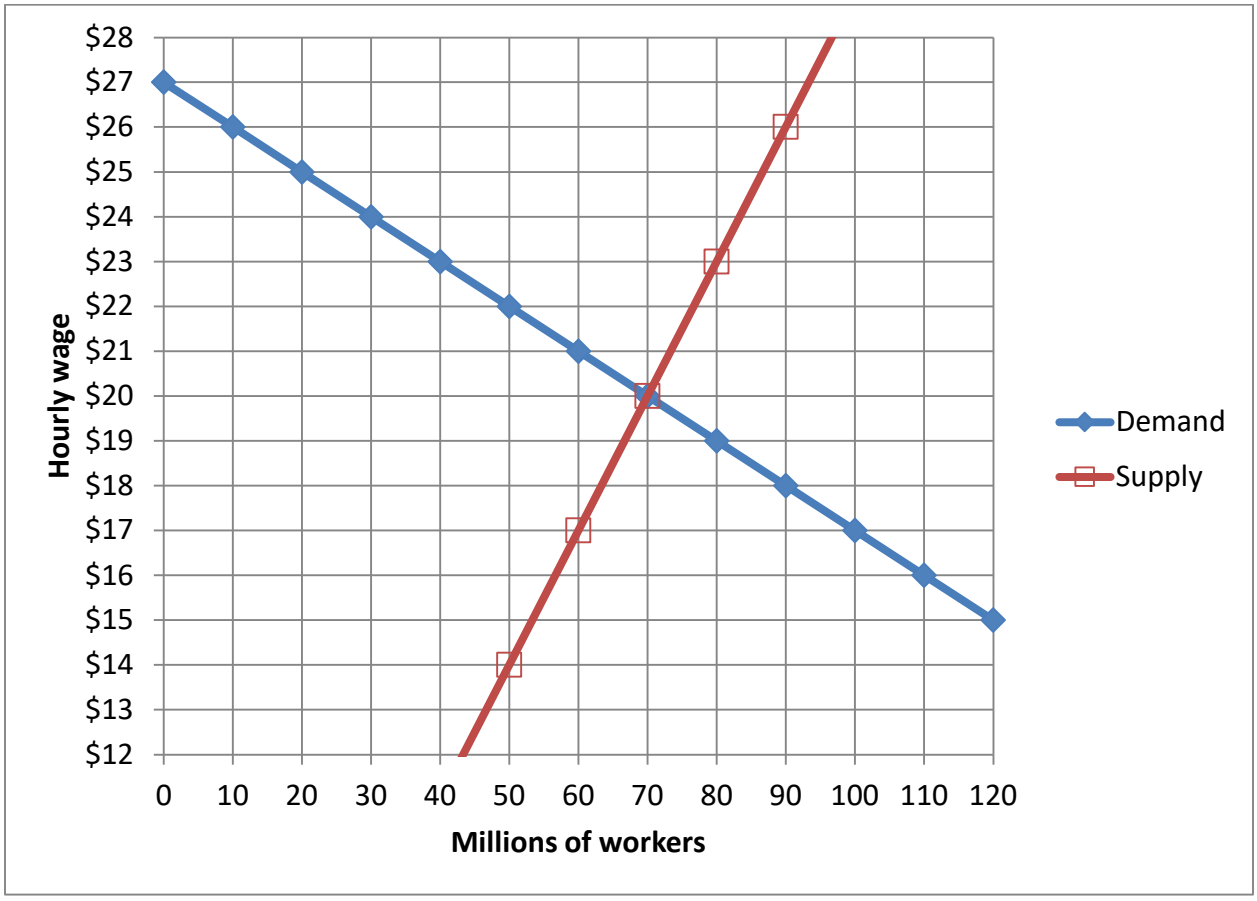
(14) The higher a person's discount rate, everything else equal,
a. the more likely the person will choose to go to college.
b. the less likely the person will choose to go to college.
c. The discount rate has no effect on the amount of education a person will choose.
d. Cannot be determined from information given.

(15) The marginal rate of return to schooling is typically estimated to be roughly
a. zero .
b. 0.02 .
c. 0.10 .
d. 0.50 .

(16) The human capital model and the job-market signaling model both predict that more educated workers are more productive and receive higher pay. But they disagree about whether
a. differences in pay are good for society.
b. education makes workers more productive.
c. employers truly care about worker productivity.
d. the labor market is competitive, with each worker and firm truly taking price as given.

II. Problems: Please insert your answer to each question in the box provided. You may use margins and graphs for scratch work. Only the answers in the boxes will be graded.

(1) [Payroll tax or subsidy: 14 pts] The graph below shows demand and supply for workers in a particular labor market.



Suppose the government pays a **payroll subsidy of $ 4** per hour.

a. Find the new level of employment.	million
b. Find the new net labor cost per hour paid by employers (excluding the subsidy).	$
c. Find the new total wage per hour received by workers (including the subsidy).	$
d. Compute the gain in employer surplus as a result of the subsidy (per hour).	$ million
e. Compute the gain in worker surplus as a result of the subsidy (per hour).	$ million
f. Compute the total direct cost of the subsidy program to the government (per hour).	$ million
g. Compute the deadweight loss caused by the subsidy (per hour).	$ million

(2) [Mandated benefits: 10 pts] Assume labor supply is given by $w = 10 + (E/5)$ and labor demand is given by $w = 100 – (E/10)$, where w denotes the daily wage and E denotes the number of workers employed.

a. Compute the equilibrium employment (E) and wage (w).

Now suppose that the government requires all employers to provide a free lunch to workers that costs employers **$9** per day per employee.

b. Give the new equation for labor demand.

W =

c. Compute the new equilibrium wage (w) and employment (E), assuming the workers do not value the free lunch.

Further suppose that the free lunch is worth **$6** to workers.

d. Give the new equation for labor supply.

W =

e Compute the new equilibrium wage (w) and employment (E), assuming the free lunch costs employers **$9** per day per employee and is worth **$6** to workers.

(3) [Gains from migration: 12 pts] Suppose there are two labor markets: North and South. Demand for labor in North is given by $\mathbf{W_N = 20 - (E_N /10),}$ where W_N is the hourly wage and E_N is the number of workers (in millions). Demand for labor in the South is given similarly given by $\mathbf{W_S = 20 - (E_S /5).}$ Labor is supplied inelastically to each market. Currently, there are 60 million workers in each market, for a total of 120 million workers.

a. Compute the current wages in each market. Show your work and circle your final answers.

Suppose workers can migrate costlessly between markets in the long run.

b. Compute the equilibrium wages and employment levels in each market in the long run. Show your work and circle your final answers.

c. Compute the net gain in efficiency for the two markets from migration. Show your work and circle your final answer. Show your work and circle your final answer. [Hint: sketch graphs first.]

(4) [Monopsony: 14 pts] Suppose a monopsony employer's demand for workers is given by

$$VMP = 32 - (E/10).$$

Labor supply to the employer is given by

$$w = 2 + (E/10).$$

a. [3 pts] Compute the efficient level of employment (E), where the value of the next worker's time equals that worker's contribution to the firm's revenue. Show your work and circle your final answer.

b. [2 pts] Recall that if labor supply is a straight line, then marginal labor cost is also a straight line, with the same intercept and twice the slope of labor supply. Give the equation for marginal labor cost (MLC).

MLC =

c. [3 pts] What level of employment (E) will the employer choose to maximize profit? Show your work and circle your final answer.

d. [3 pts] What wage (w) will the employer pay? Show your work and circle your final answer.

e. [3 pts] Suppose the government imposes a minimum wage of **$15** per hour. What level of employment (E) will the employer now choose? Show your work and circle your final answer.

(5) [Compensating differential with heterogeneous preferences: 8 pts] Suppose in an economy there are two industries, "Dirty" and "Clean." Suppose demand for labor in the Dirty industry is given by $\mathbf{W_D = 20 - 0.1\ E_D}$ and in the Clean industry is given by $\mathbf{W_C = 16 - 0.1\ E_C}$, where W denotes the wage and E denotes employment. There are **80** workers in the economy. They are all willing to work regardless of the wage, so $\mathbf{E_D + E_C = 80}$. (That is, labor is supplied inelastically to the economy as a whole.)

a. First, suppose workers do not care in which industry they work. Compute the equilibrium values of W_D, W_C, E_D, and E_C. Show your work and circle your final answers.

b. Second, suppose workers have different preferences—some strongly dislike the Dirty industry while others hardly care. In particular, suppose the supply of workers to the Dirty industry depends positively on the compensating differential: $\mathbf{(W_D - W_C) = 0.2\ E_D}$. Thus the first worker hired by the Dirty industry (E_D=1) requires hardly any differential, but the last potential worker (E_D=80) requires a differential of \$16. Again, everyone is willing to work, so $E_D + E_C = 80$. Compute the equilibrium values of W_D, W_C, E_D, and E_C. Show your work and circle your final answers.

(6) [VSL, safety regulation: 9 pts] The following regression equation has been fitted to data on a large sample of workers:

$$\text{annual earnings} = -6234 + 4502\,S + 980\,R$$

where S = total education in years, and R = annual occupational death rate per 10,000 workers.

a. Compute the value of a statistical life implied by these estimates. Show your work and circle your final answer.

Suppose a particular factory employs a large number of workers. A special ventilating system, designed to reduce workers' exposure to noxious fumes, would cost $100,000 per year. It is estimated that the system would reduce the factory's average annual death rate from 0.7 to 0.5 persons per year.

b. Compute the cost of the system per statistical life saved. Show your work and circle your final answer.

c. Given the numbers you have computed above, should the system be required? Why or why not?

(7) [Simple model of schooling decision: 13 pts] Suppose a person lives for two periods and must choose between two careers. If the person chooses "no college," the person earns $50,000 in the first period and then $50,000 in the second period. If the person chooses "college," the person earns nothing in the first period and pays college costs of $20,000, and then earns $127,000 in the second period.

First, suppose the person's discount rate between the two periods is **r = 5%.**

a. [3 pts] Compute the net present value as of the first period of "no college". Show your work and circle your final answer.

b. [3 pts] Compute the net present value as of the first period of "college." Show your work and circle your final answer.

c. [2 pts] Which career will the person choose: "no college" or "college"?

Next, consider the discount rate r* between the two periods would make the person exactly indifferent between the two careers.

d. [3 pts] Compute r*. Show your work and circle your final answer.

e. [2 pts] If the person's discount rate were *greater* than r* (found in part d) would that person choose "no college" or "college"?

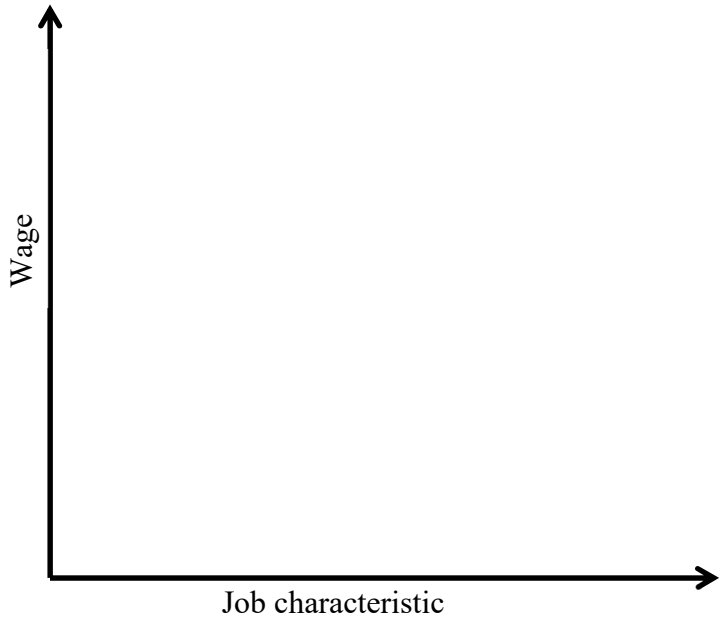
III. Critical thinking: Write a one-paragraph essay answering *one* question below (your choice). [4 pts]

(1) Consider an indifference-curve graph with wage on the vertical axis and some job characteristic that workers like (such as health insurance, free parking, etc.) on the horizontal axis. Which way must workers' indifference curves slope—up or down? Why? Illustrate your answer in the graph below.

(2) In 1970, men aged 18 to 25 were subject to military draft, with likely service in Vietnam. Men could qualify for a student deferment, however, if they were enrolled in college and making satisfactory progress toward a degree. By 1976, the draft had ended. (In fact, no one born in 1954 or later was actually drafted.) Women were never subject to the draft, so they form a potential control group. Estimate the effect of the military draft on male college enrollment using a difference-in-differences methodology and the following data. (Ignore the graph.)

Percent in college[1]	1970	1976
Female	49	50
Male	55	47

Circle the question you are answering and write your answer below. Full credit requires correct economic reasoning, legible writing, good grammar including complete sentences, and accurate spelling.



[end of exam]

[1] Percent of persons 16 to 24 years old who graduated from high school in the preceding 12 months. Source: Bureau of the Census, *Statistical Abstract of the United States*, 2012, table 276.