ECON 115 - Labor Economics
Drake University, Spring 2022
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EXAMINATION 2 VERSION A
"Equilibrium and Differences in Pay"
March 29, 2022

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, 15 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) If workers can migrate freely between labor markets, then over time,
a. employment levels will converge.
b. wage levels will converge.
c. population levels will converge.
d. All of the above.

(3) Suppose labor supply is perfectly inelastic. Who then effectively pays any payroll tax?
a. Workers pay all of the tax.
b. Workers pay most of the tax.
c. Workers and employers each pay half of the tax.
d. Employers pay most of the tax.
e. Employers pay all of the tax.

(4) If the government imposes a mandated benefit—that is, a benefit that employers are required to provide their employees—and if employees value the benefit, then
a. the labor demand curve will shift up.
b. the labor supply curve will shift up.
c. the labor supply curve will shift down.
d. labor and demand curves will no longer intersect.

(5) If a firm's labor supply curve slopes up, then marginal labor cost necessarily
a. equals the wage paid the last worker.
b. equals the average wage paid all workers.
c. is less than the wage.
d. is greater than the wage.

(6) According to the model of labor monopsony, equilibrium wage and employment lie
a. on the labor demand curve, only.
b. on the labor supply curve, only.
c. at the intersection of labor demand and labor supply.
d. None of the above.

(7) In a monopsony labor market, a modest increase in the legal minimum wage will
a. decrease employment.
b. increase employment.
c. have no effect on employment.
d. reduce average wages.

(8) Agreements between employers not to "poach" each others' workers
a. tend to keep wages up.
b. are recommended by the government.
c. are illegal under antitrust laws.
d. never occur because they are unprofitable.

(9) Employers are willing to pay compensating wage differentials to attract workers to high-risk jobs because
a. it is good public relations.
b. they feel a moral responsibility to their workers.
c. making the jobs safer would be even more costly.
d. such wage differentials are legally required by the Occupational Safety and Health Act.

(10) Consider a diagram with wages on the vertical axis and some other job characteristic on the horizontal axis. If the job characteristic is disliked by workers—like noise—then workers' indifference curves must
a. slope down.
b. slope up.
c. be horizontal.
d. be vertical.

(11) The theory of hedonic equilibrium assumes that
a. all workers have the same indifference curves.
b. all firms have the same isoprofit curves.
c. all jobs are either low-risk or high-risk.
d. all workers and firms take the hedonic wage function as given.

(12) Seasonal jobs must offer a compensating wage differential if
a. some workers prefer year-round jobs.
b. most workers prefer year-round jobs.
c. the marginal worker prefers a year-round job.
d. there are more seasonal jobs than year-round jobs.

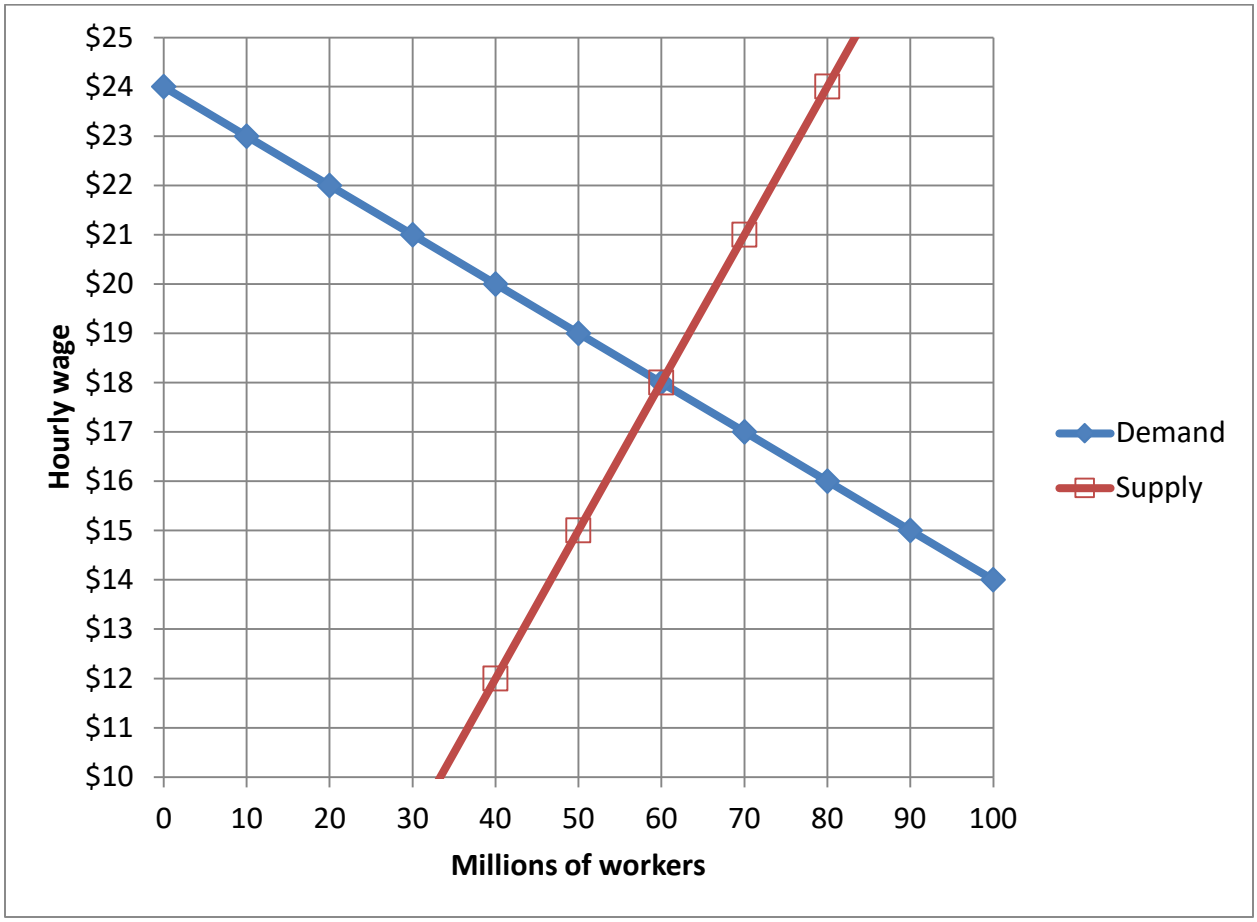
(13) The economic cost of a college education does not include
a. tuition payments.
b. the opportunity cost of the student's time.
c. room and board.
d. the cost of books and fees.

(14) If more able persons tend to get more education than other persons, then ordinary least squares regression of earnings on schooling will tend to
a. underestimate the returns to schooling.
b. overestimate the returns to schooling.
c. estimate the returns to schooling without bias.
d. Cannot be determined from information given.

(15) According to the model of job-market signaling, by getting more education, a worker increases her or his
a. productivity.
b. pay.
c. ability to learn on-the-job.
d. All of the above.
e. None of the above.

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 imposes a **payroll tax of $ 4** per hour.

a. Find the new level of employment.

b. Find the new total labor cost per hour paid by employers (including the tax).

c. Find the new net wage per hour received by workers (excluding the tax).

d. Compute the loss of employer surplus as a result of the tax (per hour).

e. Compute the loss of worker surplus as a result of the tax (per hour).

f. Compute the tax revenue collected by the government (per hour).

g. Compute the deadweight loss caused by the tax (per hour).

	million
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(2) [Gains from migration: 10 pts] Suppose there are two labor markets: North and South. Demand for labor in North is given by $\mathbf{W_N = 30 - (E_N /10),}$ where W_N is the annual wage (in thousands of dollars) and E_N is the number of workers (in millions). Demand for labor in the South is given similarly given by $\mathbf{W_S = 30 - (E_S /5).}$ Labor is supplied inelastically to each market. Currently, there are 60 million workers in each market, for a total of 120 million workers.

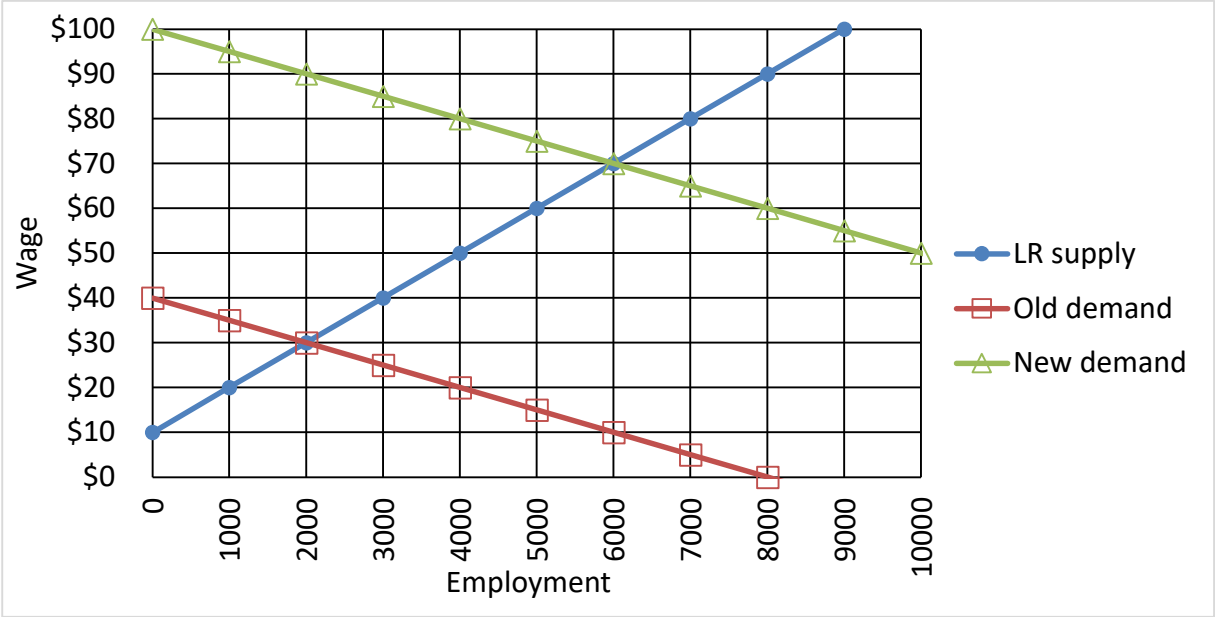
a. [2 pts] Compute the current wages in each market. Show your work and circle your final answers.

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

b. [4 pts] Compute the equilibrium wages and employment levels in each market in the long run. Show your work and circle your final answers.

c. [4 pts] Compute the total 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.]

(3) [Cobweb model: 8 pts] The market for IT professionals is shown in the graph below. Long-run supply—say, in five years—is an upward-sloping curve as shown in the graph. Further assume that supply in five years is determined by today's wage, because people decide to enter training to be IT professionals based on the wage today. By contrast, short-run supply is perfectly inelastic, because IT professionals cannot be trained overnight.



Initially, demand is at "Old demand."

a. Find the initial equilibrium level of employment.

E=

Then breakthroughs in computer technology increase the demand for IT professionals to "New demand."

b. In the short run, labor supply is perfectly inelastic. Put differently, the wage adjusts quickly in the short run, but employment does not. What is the short-run equilibrium wage?

W = $

The cobweb model assumes that the supply of IT professionals in five years depends on the wage today.

c. Find the quantity supplied of IT professionals in five years.

E=

Assume the demand curve remains at "New Demand." Again, the wage adjusts to clear the market.

d. What will turn out to be the wage in five years?

W = $

Use the same reasoning to find the short-run equilibrium in *ten* years.

e. Find the level of employment in ten years.

E=

f. Find the wage in ten years.

W = $

Find the new long-run equilibrium

g. Find the long-run equilibrium level of employment.

E=

h. Find the long-run equilibrium wage.

W = $

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

$$VMP = 30 - (E/10).$$

Labor supply to the employer is given by

$$w = 6 + (E/10).$$

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 $\mathbf{W_C = 14 - 0.1\ E_C}$, where W denotes the wage and E denotes employment. There are **100** workers in the economy. They are all willing to work regardless of the wage, so $E_D + E_C = 100$. (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=100) requires a differential of $20. Again, every one is willing to work, so $E_D + E_C = 100$. 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: 6 pts] The following regression equation has been fitted to data on a large sample of workers:

$$\text{annual earnings} = -5215 + 3542\,S + 1035\,R$$

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 0.9 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 $40,000 in the first period and then $40,000 in the second period. If the person chooses "college," the person earns nothing in the first period and pays college costs of $10,000, and then earns $94,000 in the second period.

First, suppose the person's discount rate between the two periods is **r = 4%.**

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"?

(8) [Who pays for OJT: 8 pts] Suppose that, without training, a computer programmer's value of marginal product is $40,000 per year. If the programmer is trained in the first year, the programmer's value of marginal product rises to $45,000 per year in the second year. However, training costs the employer $5,000. For simplicity, assume the programmer stays with the firm a maximum of two years, and assume the interest rate is zero.

First, suppose that the programmer is trained in a computer language like Python, which is used at many employers.

a. Why won't a constant wage scheme—$40,000 in both years—work?

b. What wage scheme *will* be paid in equilibrium?

What will be the programmer's wage in the first year, during training? $

What will be the programmer's wage in the second year, after training? $

Alternatively, suppose that the programmer is trained in a special computer language that is only used at this employer.

c. Why won't the wage scheme in your answers to (a) and (b) work anymore?

d. What wage scheme *will* be paid in equilibrium? Give an example.

What could be the programmer's wage in the first year, during training? $

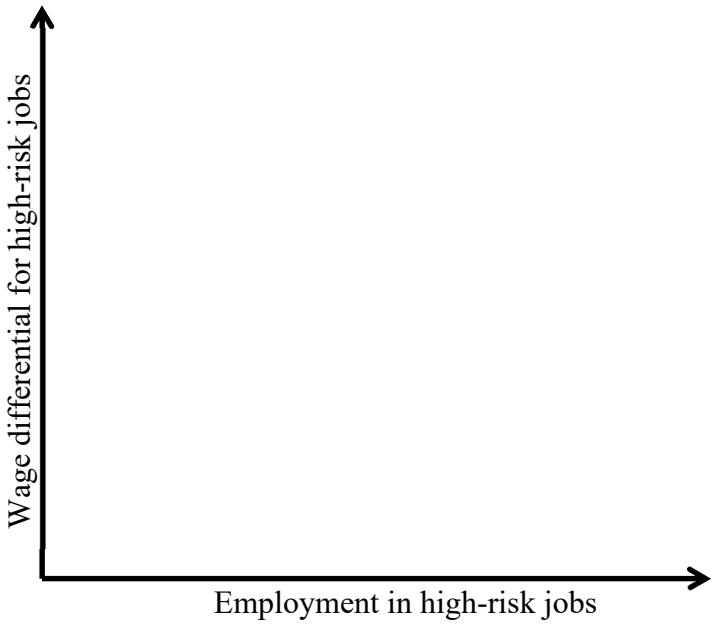
What could be the programmer's wage in the second year, after training? $

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

(1) The theory of compensating wage differentials predicts that there is a tradeoff in the labor market between wages and benefits. But workers like lawyers and executives enjoy *both* higher wages *and* more attractive benefits like health insurance than workers like store clerks and laborers. Does this fact contradict the theory of compensating differentials? Why or why not? (Ignore the graph below.)

(2) Economic historians have shown that the wage differential for high-risk jobs has *increased* over time, while the fraction of high-risk jobs in the economy has *decreased*.[1] Could this be caused by a shift in *demand* for employment in high-risk jobs, or a shift in *supply* (choose one)? Which direction? Illustrate your answer with a graph of the demand and supply for employment in high-risk jobs. Label all curves.

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] Costa, Dora and Matthew E. Kahn. 2004. "Changes in the Value of Life, 1940-1980." *Journal of Risk and Uncertainty*, 29 (2), 159-80. (See table 6, p. 172.)