Labor Economics Field Exam
Econ 261B — Haanwinckel
September 2024

Item 1 (40 points)

Consider a **competitive** economy with two types of workers, A and B. Both worker types supply their labor inelastically, and each corresponds to half of the workforce. To produce one unit of the final consumption good, the **representative firm** needs tasks of different complexity levels, indexed by x. Specifically, it needs one task of complexity $x = 1$, one task of complexity $x = 2$, and one task of complexity $x = 3$. If a worker of type $i \in \{A, B\}$ spends all his time working on task x, this worker can produce $\alpha_i(x)$ of those tasks. This function satisfies:

$$\alpha_i(x) > 0 \quad \text{and} \quad \frac{\alpha_B(x)}{\alpha_A(x)} \text{ is increasing in } x$$

The representative firm chooses how to assign workers to tasks. For example, it could assign a worker A to spend half of its time on tasks $x = 1$ and the other half on tasks $x = 2$, such that this worker would produce $0.5\alpha_A(1)$ tasks of complexity 1 and $0.5\alpha_A(2)$ tasks of complexity 2.

In the competitive equilibrium, wages are denoted by w_A and w_B. The numeraire is the final good.

1.1 (10 pts): Write down the condition that determines which worker the firm chooses to assign to tasks of a given complexity level x. *Hint: think about the cost of producing a given type of task with each type of labor.*

1.2 (10 pts): Consider the following statement: "In equilibrium, workers of type B will spend at least part of their time producing tasks of complexity $x = 3$." Is it true or false? Give a super short explanation. No need for math, though math is ok if you think it's easier to explain in that way.

For the following items, consider the introduction computer capital, a new factor of production in the economy denoted by K. There is a representative producer of computers that can transform γ units of the final consumption good into one unit of K. *Hint: Given that the model is competitive and that the final good is the numeraire, the capital-producing firm makes zero profits and the price of capital will be $p_K = \gamma$.* Each unit of computer capital can be used to produce one unit of tasks $x = 2$. It cannot produce any other task.

1.2 (10 pt): Write down a condition such that the introduction of the capital-producing firm in the model makes no difference for equilibrium wages.

1.3 (5 pt): Assume that the introduction of capital does make a difference for equilibrium wages (that is, the condition you wrote above is false). Can you tell what happens to the wage gap w_A/w_B—does the ratio rise, fall, or stay constant? If you cannot tell, explain why not.

1.4 (5 pt): As in 1.3, assume that the introduction of capital changes equilibrium wages. Can you tell what happens to total production of the final good?

Item 2 (30 points) Analyse the following statements about the theory of compensating differentials based on competitive labor market models, in the tradition of Rosen (1986). For each statement, write down whether they are true or false and provide a short explanation.

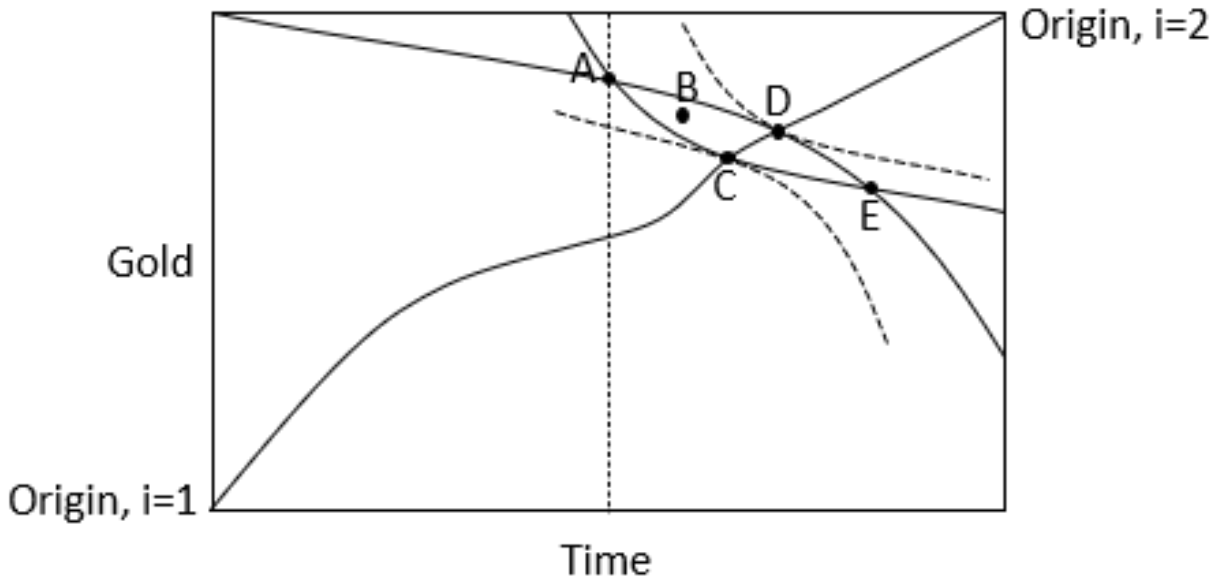
(I) Consider a model where firms can either have or not have a "disamenity." A compensating wage differential corresponds to the monetary value that would compensate the average worker for having to content with that disamenity.

(II) The theory of compensating differentials can only be applied to situations where firm-provided amenities are exogenous, that is, firms are not allowed to pay some cost to provide better working conditions.

(III) If the model is competitive and the disamenity is a binary as in statement I, a regression of log wages on an indicator for the worker being in a firm with the disamenity will always identify the equilibrium compensating wage differential in that economy.

Item 3 (30 points):

Consider an isolated economy with two households, indexed by $i \in \{1, 2\}$, and two exchangeable goods, gold and time, as in Problem Set 4. Each household has preferences that are convex and strictly increasing in consumption of each good. The endowments are represented by point A in the Edgeworth box below:



The solid line linking the two origins is the contract curve. The solid curves intersecting at points A and E are indifference curves for each household.

For each of the following questions, you only need brief explanations. One or two sentences is probably enough.

3.1 (10 pts): In the allocation represented by point C, which household would you call employer and which household would you call worker?

3.2 (10 pts): When economists evaluate market outcomes, they typically rule out allocations outside of the small, lens-shaped area $ACED$. Why? If you can, provide an example of a labor-related institution (perhaps a historical one) that would correspond to an allocation outside of that area.

3.3 (10 pts): It is also common in economics to rule out allocations outside of the line connecting points C and D. Why? If you can, provide an example of labor-related situation or institution that would correspond to an allocation within the lens-shaped area $ACED$, but outside of the line connecting C and D.

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Instructions

This is a closed book examination. No written materials are allowed.

You have 1 hour to complete the exam. It is worth 100 points. You must obtain at least 75 points to pass this exam.

Consider an individual i living for T periods with utility function $U(c, l) = U(c, T - h)$, where c is consumption, l is leisure, T is total time available, and h is hours of work. Individual i is endowed with non-labor income Y, receives a wage w if working, and can save using a risk-free asset with gross return R. The government collects taxes on labor earnings, with a tax rate equal to τ for each dollar earned. THERE IS UNCERTAINTY in non-labor income and wages. The following questions are related to the three labor supply functions and corresponding elasticities we studied in class.

1. (10 points) Write down individual i's decision problem over the life cycle.

2. (15 points) Use two-stage budgeting to derive the period t sub-problem for individual i that can be used to recover the Marshallian labor supply function (you don't have to recover the labor supply function).

3. (5 points) The utility function is such that the corresponding Marshallian labor supply function takes the following form:

$$h_t^m = \alpha + \beta \ln w_t + \gamma \frac{Y_t}{w_t} + \epsilon_t^m.$$

   Derive the Marshallian labor supply elasticity.

4. (10 points) Write down the period t sub-problem for individual i that enables you to derive the Hicksian labor supply function (you don't have to recover the labor supply function).

5. (5 points) The utility function is such that the corresponding Hicksian labor supply function takes the following form:

$$h_t^h = \phi + \delta \ln w_t - \theta w_t^{-\eta} U + \epsilon_t^h,$$

   where U is the level of utility. Derive the Hicksian labor supply elasticity.

6. (5 points) Using only the definition of Marshallian and Hicksian labor supply functions, is the Marshallian or Hicksian labor supply elasticity larger if leisure is a normal good? (Don't use the elasticities you have found in the previous parts, just the definition of Marshallian and Hicksian labor supply functions)

7. (15 points) Suppose the utility function takes the following form:

$$U(c, T-h) = \frac{C^{1+\rho}}{1+\rho} - \kappa \frac{h^{1+\sigma}}{1+\sigma}.$$

With $\eta \leq 0$ and $\sigma \geq 0$. Derive the Frish labor supply function.

8. (5 points) Recover the Frish labor supply elasticity.

9. (10 points) The government wishes to increase the marginal tax rates τ by 1 percent just for a month to reduce the budget deficit. But it is worried that the increase will reduce labor supply and, thus, the increase in tax revenue will not be enough to reduce the deficit below their target. Of the three labor supply elasticities you derived above, which one should the government use to approximate individual i's labor supply response to the temporary increase in τ? Why?

10. (10 points) The government decides to make the increase in τ permanent. How can the government approximate individual i's labor supply response to this reform?

11. (10 points) The government asks you to estimate the Frish labor supply function you derived earlier. What are the main econometric issues you need to address to estimate it?