Final Exam ECON4715 – Labour economics
Autumn 2017

This exam has 5 questions, with in total 18 sub-questions.
When answering the questions on the exam you should be brief and to the point!
Make sure to write clearly. Difficult to decipher answers will not be counted!

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1. In this question you have to indicate whether you think the statement is true or false and explain why. You do not get any points if you only state whether the statement is true or false.

   (a) If a worker in a competitive firm obtains general training, the firm will always pay the cost of this training.

False. Competitive firms provide general training only if they do not pay any of the costs! A firm that paid for general training and did not raise the post-training wage would get an oversupply of trainees and the workers would quit in the post-training period.Theory therefore predicts that if training is general, workers pay for the training by accepting a lower wage during the training period.

   (b) If all employers have perfect information there will be no employer discrimination.

False. If all employers have perfect information in the sense that they observe each worker's productivity there will be no statistical discrimination, but there can still be taste-based discrimination due to employer's distaste of employing workers from certain groups.

(c) A firm that pays efficiency wages will never pay a wage that is above the wages payed by other firms.

False. The wage at which the marginal cost of increasing the wage equals the marginal gain in the productivity of workers is called the efficiency wage. An important condition for the existence of effciency wages is that a higher wage increases worker productivity. A profit maximizing firm will set the efficiency wage regardless of the value of the competitive wage determined outside the firm. However, firm has to pay an efficiency wage that is above the competitive wage otherwise it attracts no workers. So although there might be other firms that pay even higher (efficiency) wages, it is not the case that a firm that pays efficiency wages will never pay a wage that is above the wages payed by other firms. Instead, the efficiency wage will be higher than the competitive wage paid by firms that do not pay efficiency wages.

2. Consider an open competitive economy that produces a single aggregate good using the following production function that combines capital and labor:

$$Q(K, L) = K^{0.5} L^{0.5}$$

The price of output Q is set at unity and the number of native workers in this economy is perfectly inelastic.

(a) Derive the *short-run* effect on the wage rate from an increase in labour supply by 10% due to an influx of immigrants entering the labour market.

Theory of factor demand in competitive economy implies that factor prices equal marginal productivity.

$$w = \frac{\partial Q(K,L)}{\partial L} = 0.5 \cdot K^{0.5} \cdot L^{-0.5}$$
$$r = \frac{\partial Q(K,L)}{\partial K} = 0.5 \cdot K^{-0.5} \cdot L^{0.5}$$

Taking logs gives:

$$log(w) = log(0.5) + 0.5log(K) - 0.5log(L)$$
$$log(r) = log(0.5) + 0.5log(L) - 0.5log(K)$$

By totally differentiating the two equations we obtain the following:

$$dlog(w) = 0.5 \cdot dlog(K) - 0.5 \cdot dlog(L)$$
$$dlog(r) = 0.5 \cdot dlog(L) - 0.5 \cdot dlog(K)$$

In the short run capital is fixed, so $dlog(K) = 0$:

$$\frac{dlog(w)}{dlog(L)} = -0.5$$

This shows that an increase in labour supply by 10% due to an influx of immigrants *reduces* the wage rate in the short run by 5%.

(b) Derive the *long-run* effect on the wage rate from an increase in labour supply by 10% due to an influx of immigrants entering the labour market.

Because the rental rate of this economy increases in the short-run it will attract an inflow of capital. In the long run the rental rate will be equal to the world rental rate and $dlog(r) = 0$.

$$dlog(r) = 0.5 \cdot dlog(L) - 0.5 \cdot dlog(K) = 0$$

$$dlog(K) = dlog(L)$$

If immigration increases labor supply by 10%, capital must eventually also increase by 10%
Long run impact of immigration on wages:

$$\begin{aligned} dlog(w) &= 0.5 \cdot dlog(K) - 0.5 \cdot dlog(L) \\ &= = 0.5 \cdot dlog(L) - 0.5 \cdot dlog(L) = 0 \\ &= 0 \end{aligned}$$

This shows that an increase in labour supply by 10% due to an influx of immigrants *does not affect* the wage rate in the long run.

(c) What are the *long-run* consequences of the increase in labour supply by 10% due to an influx of immigrants for total output of this economy?

In the long run, both capital and labour increase by 10%:

$$\begin{aligned} Q_{new} &= (1.1K)^{0.5} \cdot (1.1L)^{0.5} \\ &= (1.1)^{0.5} K^{0.5} (1.1)^{0.5} L^{0.5} \\ &= 1.1 \cdot (K^{0.5} \cdot L^{0.5}) \end{aligned}$$

This implies that total output increases by 10%

3. Consider an unemployed individual receiving unemployment benefits who applies sequential search.

   (a) Explain what will happen with the cost and expected benefits from additional search as well as with the asking wage of this individual if there is a reduction in unemployment benefits

If the individual gets a wage offer w^0 he decides to accept the offer or to continue searching by comparing the costs and expected benefits

Expected benefits (MR): probability of getting a higher offer times the present value of the expected wage increase

$$P(w \geq w^0) \times \frac{E(w - w^0 | w \geq w^0)}{r}$$

Costs (MC): opportunity costs (current offer - unemployment benefits b) + search costs c

$$(w^0 - b) + c$$

The **asking wage** $\widetilde{w}$ is the threshold wage at which the worker is indifferent between accepting the offer and continue searching

$$\widetilde{w} = b - c + P(w \geq \widetilde{w}) \times \frac{E(w - \widetilde{w} | w \geq \widetilde{w})}{r}$$

If the unemployment benefits b decrease, this increases the opportunity cost of additional search. The expected benefits are unaffected. As a results the asking wage will decrease.

(b) Suppose this individual suddenly cares more about the future. Explain what will happen with the cost and expected benefits from additional search as well as with the asking wage of this individual.

If the individual gets a wage offer w^0 he decides to accept the offer or to continue searching by comparing the costs and expected benefits

Expected benefits (MR): probability of getting a higher offer times the present value of the expected wage increase

$$P(w \geq w^0) \times \frac{E(w - w^0 | w \geq w^0)}{r}$$

Costs (MC): opportunity costs (current offer - unemployment benefits b) + search costs c

$$(w^0 - b) + c$$

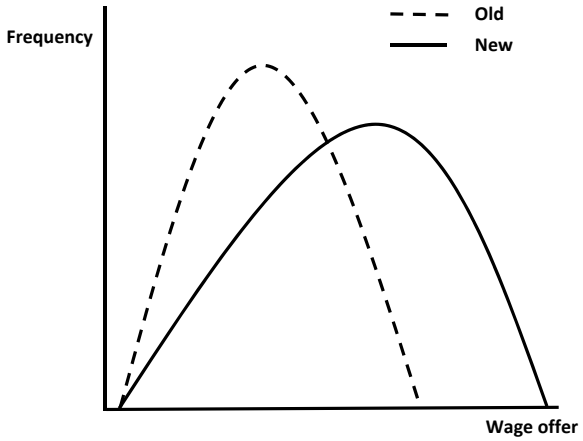
The **asking wage** $\widetilde{w}$ is the threshold wage at which the worker is indifferent between accepting the offer and continue searching

$$\widetilde{w} = b - c + P(w \geq \widetilde{w}) \times \frac{E(w - \widetilde{w} | w \geq \widetilde{w})}{r}$$

If the individual suddenly cares more about the future this implies that he will have a lower discount rate r. A lower discount rate increases the expected benefits from search. The cost (which are incurred in the present) are unaffected. As a results the asking wage will increase.

(c) Suppose the wage offer distribution of the individual changes. Figure 1 shows the old and the new wage offer distributions. Explain what will happen, at a given wage offer w_0, with the cost and expected benefits from additional search as well with as the asking wage of this individual.

Figure 1. Wage offer distributions



If the individual gets a wage offer w^0 he decides to accept the offer or to continue searching by comparing the costs and expected benefits

Expected benefits (MR): probability of getting a higher offer times the present value of the expected wage increase

$$P(w \geq w^0) \times \frac{E(w - w^0 | w \geq w^0)}{r}$$

Costs (MC): opportunity costs (current offer - unemployment benefits b) + search costs c

$$(w^0 - b) + c$$

The **asking wage** $\widetilde{w}$ is the threshold wage at which the worker is indifferent between accepting the offer and continue searching

$$\widetilde{w} = b - c + P(w \geq \widetilde{w}) \times \frac{E(w - \widetilde{w} | w \geq \widetilde{w})}{r}$$

If the wage offer distribution changes as indicated in Figure 1, higher wage offers become more likely. For a given wage offer w_0 both $P(w \geq w^0)$ and $E(w - w^0 | w \geq w^0)$ increase which implies an increase in the expected benefits from additional search. The cost are unaffected. As a results the asking wage will increase.

4. This question is about: Bhuller, M., M. Mogstad, and K. G. Salvanes (2017). Life Cycle Earnings, Education Premiums, and Internal Rates of Return. Journal of Labor Economics 35(4): 993-1030.

Table 1. Comparison of Returns to Schooling Estimates

	Full Sample, OLS Estimate (1)	IQ Sample, IQ Control Estimate (2)	IV Sample, IV Estimate (3)	Twins Sample, Twin FE Estimate (4)
A. Mincer Returns to Schooling				
Point Estimate	.062***	.047***	.022*	.048***
(standard error)	(.001)	(.001)	(.011)	(.001)
Number of observations	600,200	325,314	576,049	6,398
B. Internal Rate of Return to Schooling				
Point Estimate	.093***	.083***	.112**	.089***
(standard error)	(.002)	(.003)	(.048)	(.008)
Number of observations	601,290	325,417	577,098	6,434

(a) The Mincer earnings equation is specified as $log(Y) = \mu_0 + \mu_1 S + \mu_2 X + \mu_3 X^2 + \epsilon$, where Y is earnings, S is years of schooling, X is experience, and ϵ is an error term. Table 1, panel A, column (1), shows a point estimate of .062 for μ_1 from an OLS regression of the Mincer equation. Interpret this estimate and discuss whether this is a causal estimate of the effect of schooling on log earnings?

The OLS estimate of .062 shows that an additional year of schooling is associated with having 6.2% higher earnings, conditional on experience. This is not a causal estimate of the effect of schooling on log earnings when there is unaccounted selection into schooling (ability bias) or when the schooling variable is mismeasured. For instance, if individuals with more schooling also have higher ability, which is unobserved and not controlled for, the OLS estimate of μ_1 would be biased upwards and tend to overstate the causal returns to schooling. In contrast, when the schooling variable has a (classical) measurement error (and otherwise no ability bias), the OLS estimate of μ_1 will be biased downwards and tend to understate the causal returns to schooling.

(b) Table 1, panel A, column (3), provides an estimate based on an instrumental variables (IV) approach. Compare the IV estimate to the OLS estimate.

The IV estimate of .022 shows that having an additional year of schooling increases earnings by 2.2%. This approach uses only exogenous variation in schooling coming from the instrument and the resulting estimate is causal and wouldn't suffer from an ability bias; the instrument is supposedly uncorrelated to ability and only affects earnings through its impact on schooling. Since the IV estimate at .022 is lower than the OLS estimate at .062, this is consistent with a positive ability bias in the OLS estimate, as one would expect with homogenous returns. If returns to schooling are heterogeneous, the IV estimate would be the average causal effect of schooling on earnings for "compliers", i.e. individuals who take more schooling only due to the instrument (compulsory schooling reform exposure). In the latter case, the IV estimate can be larger than the OLS estimate if the returns for compliers are sufficiently large. The IV estimate can also be larger than the OLS estimate if there is a substantial measurement error in the schooling variable (unlikely here).

(c) Consider an age-specific earnings equation $Y_t = \alpha_t + \beta_t S + \varepsilon_t$, where Y_t is annual earnings (in levels), β_t is the earnings premium to years of schooling S, and ε_t is an error term at age $t \in \{0, T\}$. The internal rate of return (IRR) to schooling is denoted ρ and defined implicitly by the equation $\sum_{t=0}^{T} \frac{\beta_t}{(1+\rho)^t} = 0$. Explain what the IRR is supposed to capture.

The IRR is the discount rate that equates the present value of lifetime earnings stream for alternative schooling choices, which can be compared to the market interest rate to determine when schooling investments should go up or down.

(d) Under stylized assumptions, the Mincer returns to schooling μ_1 will equal the internal rate of return ρ. Table 1 shows that the Mincer returns to schooling estimates in Panel A don't equal the IRR estimates in Panel B for the Norwegian data. Give two possible reasons that these two parameters may differ in practice.

The paper provides evidence against two stylized assumptions in the Mincer model: i) zero earnings while in school, and ii) exogenous employment. Another reason why the Mincer returns to schooling could differ from the IRR can be failure of the assumption that log-earnings experience profiles are parallel across schooling (i.e., non-zero interaction terms between schooling and experience in the Mincer equation). When the Mincer equation is estimated using cross-section data, while the IRR is estimated using panel or repeated cross-section data, another reason for a difference in returns could be non-stationarity.

5. This question is about: DiNardo, J. and D. S. Lee (2004). Economic Impacts of New Unionization on Private Sector Employers: 1984–2001. Quarterly Journal of Economics 119(4): 1383- 1441.

   (a) Explain why the phrase "impact of unionization on wages" is ambiguous and can refer to many different parameters of interest?

   This paper conceptualizes the following parameters of interest, each representing alternative notions of "wage impacts of unionization":

   i) the wage impact of a union (barely) winning a representation election and being authorized as the exclusive representative of the workers in collective bargaining negotiation, relative to the case where a union barely looses the election ("union representation" effect),
   ii) the wage impacts of a union election being held where the union lost, relative to the case where unions are allowed but no election is held ("threat of a future election" effect),
   iii) the wage impacts of increased union support (an increase in the vote share or the membership rate), irrespective of this increased support actually leading to a representation election or changing probability that the union becomes the sole bargaining representative ("threat of an election" effect)
   iv) the wage impacts of a change in law permitting unions relative to the (unrealistic benchmark) case where law prohibits unions and any kind of collective bargaining activity ("union legislation" effect).
   Students may use Figure I on page 1394 in the paper in their explanation, but are not required to reproduce this. The paper solely considers the above-mentioned average firm wage effects. In general, one may adistinguish between the impact of an individual worker joining a union on this worker's individual wage, and the various impacts of "unionization" (as in i)-iii) above) on the individual worker's wages. The various impacts of "unionization" may further also depending on whether the worker is a union member or a non-member.

   (b) This paper uses a regression discontinuity (RD) design for identification, by comparing outcomes for employers where a union barely won a representation election with outcomes for employers where a union barely lost. Explain what type of unionization effect on wages this RD design will capture, and also the types of unionization wage effects which will not be identified by this design?

   This RD design will (in the best case scenario) only capture the notion of a "union representation" effect as described in point i) in the previous answer. The remaining "unionization impacts" will not contribute to this RD estimate.

(c) To assess the "threat" effects of unionization on wages, the following equation is estimated for the sample of firms where a union lost the representation election:

$$w_{it} = \alpha_i + \gamma_t + \sum_{k=-6}^{11} D_{it}^k \delta_k,$$

where w_{it} is average wage in firm i in time period t, α_i is a time-invariant firm fixed effect, γ_t is a year-effect, and D_{it}^k is a dummy variable that takes the value 1 if the election took place in period $t-k$, and 0 otherwise. Explain what the "threat" effects of unionization are and explain how δ_k capture these effects.

In general, possible threat effects of unionization can represent any of the three notions mentioned in points ii)-iv) above, i.e. "threat of a future election" effect, "threat of an election" effect, or "union legislation" effect. Post-election estimates (δ_k for $k \in \{1, 11\}$) from the "event-history" wage equation for firms where the union lost a representation election will capture the "threat of a future election" effects that correspond to the notion described in point ii).

(d) Suppose a firm and a union are bargaining. Explain why a bargaining contract can lie off the demand curve in a wage-employment diagram. Explain the difference between an efficient contract and a strongly efficient contract.

We start by describing the union's indifference curve and the firm's isoprofit curve in a wage-employment diagram with a downward sloping demand curve. The union's indifference curve is convex from origin in this diagram (both higher wage and higher employment are desirable). The firm's isoprofit curve intersects the demand curve at the point with the highest feasible wage for a given level of profit and otherwise outside the demand curve wages must be lower to maintain equal profits; this gives an inverse-U shape for firm's isoprofit curve. The firm's allocation in a competitive market and with a monopoly union both lie on the demand curve.
Starting from a monopoly union allocation (with a higher wage & lower employment than the allocation in a competitive market), the firm can try to convince the union to reduce wages and increase employment, as this will shift the allocation to a lower isoprofit curve (with higher profit) while maintaining the union's utility (movement along the union's indifference curve). By moving to the right of the demand curve, the firm would be better off while the union would be indifferent. Similarly, the union can try to convince the firm to reduce wage and increase employment, by moving along the firm's isoprofit curve to the right of the demand curve, as this will shift the union's allocation to a higher indifference curve (with higher utility).
The contract curve gives all points where the union's indifference curves are tangent to the firm's isoprofit curves, and will always be to the right of the demand curve in a wage-employment diagram. Relative to the monopoly union allocation, there exist allocations along the contract curve where either the union gets higher utility (for given firm profits), the firm gets higher profits (for given union utility), or both the firm and the union are better off.

(e) Suppose a firm and a union are bargaining. Explain the difference between an efficient contract and a strongly efficient contract.

Allocations along the contract curve are said to be efficient contracts in the sense that they exhaust all bargaining opportunities between the firm and the union (Pareto efficiency); however, these may not be efficient in an allocative sense. While strongly efficient contracts may exist if the contract curve is vertical, such that the employment is always equal to the competitive (non-union) employment and hence also efficient in an allocative sense.
See discussion on pp. 428-430 in Borjas "Labor Economics" 7th edition. Figure 10-7 shows an efficient contract, while Figure 10-8 shows a strongly efficient contract. Student may draw such diagrams as part of the explanations.