Labor Economics: Human Capital

Tutorial Session

Contents

1 Quiz

(1) Consider the seminal model by Spence (1973) as presented in class. High productivity workers always prefer the option to signal their ability.

(2) Based on the discussion in class, the option value of schooling is always strictly positive for all schooling transitions.

(3) The accounting-identity model as presented in Heckman, Lochner, & Todd (2006) provides a justification for interpreting the Mincer coefficient as an internal rate of return.

(4) A college tuition subsidy always leads to an increase in high school graduation rates regardless of the individual time preferences.

(5) Heckman, Stixrud, & Urzua (2006) report that the effect of cognitive skills on social outcomes is always more pronounced than the effect of noncognitive skills.

(6) Keane & Wolpin (1997) find that a basic model of human capital investment explains the observed investment patterns just as well as their extended model.

(7) Carneiro, Heckman, & Vytlacil (2011) find that individuals make their schooling decisions in light of heterogeneous returns.

(8) Keane & Wolpin (1997) point to heterogeneous schooling levels at age 16 as the main determinant of inequality in expected total lifetime utility.

(9) Heckman, Lochner, & Todd (2006) compile several pieces of evidence that point towards a rejection of the standard Mincer regression model.

(10) Lagakos, Moll, Porzio, Qian, & Schoellman (2018) find that wages increase substantially more over the life cycle in poor countries than in rich countries.

(11) Lagakos et al. (2018) show that their core findings hold up regardless of whether they focus on part or full time male wage workers.

(12) Lagakos et al. (2018) determine that differences in long-term contracts are an important driver of cross-country differences in life cycle wage growth.

(13) Lagakos et al. (2018) determine that human capital or search frictions are promising explanations for the cross-country differences in life cycle wage growth.

(14) Keane & Wolpin (1997) find that the predictions of life cycle choices from a static and dynamic model of human capital investments are in general agreement.

(15) Keane & Wolpin (1997) find that a $2,000 college tuition subsidy has a pronounced impact on the expected present value of lifetime utility.

(16) Carneiro et al. (2011) report point estimates that the marginal benefit of treatment for the average individual remains positive when moving along the distribution of V.

(17) Heckman, Lochner, & Todd (2006) restrict their analysis to the ex post return to schooling.

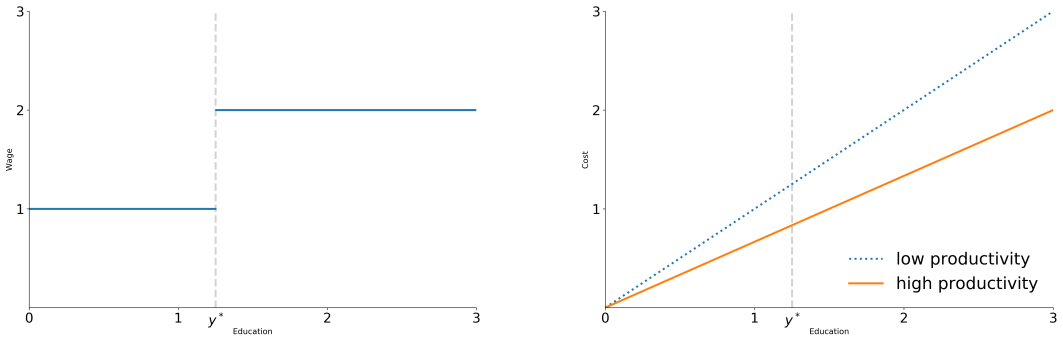
2 Introduction

Consider the motivating models of Spence (1973) and Ben-Porath (1967) as discussed in class.

(1) For both models, provide a brief description of the question they are designed to address and their key ingredients. Provide two examples of important economic features that are missing from the formal analysis?

Consider the model developed in Spence (1973) in more detail. Figure 1 visualizes the information about the wage schedule and the cost of education in the parametrized model. Please assume throughout that employers belief that individuals with a level of education $y^* \geq \frac{5}{4}$ have a high productivity.

Figure 1: Model parametrization



(a) Wage schedule **(b)** Cost of education

(2) Write down the parametrization of the cost (c_L, c_H) and wage (w_L, w_H) functions for the high and low productivity individuals.

(3) Complete Figure 2 by adding the surplus functions for each of the two groups over the specified range. Also, indicate the optimal level of schooling for each of the two groups.

(4) Calculate the range of the separating schooling level y^* that confirms the employer's beliefs.

Now consider the case where individuals do not have the ability to signal their productivity and the share of individuals with low productivity is denoted by q_L.

(5) What is the wage for each of the two groups in this scenario as a function of q_L?

(6) Complete Figure 3 by adding the surplus and wage for the two groups under the scenario where individuals are able to signal their ability and when they are not.

Figure 2: Surplus of education

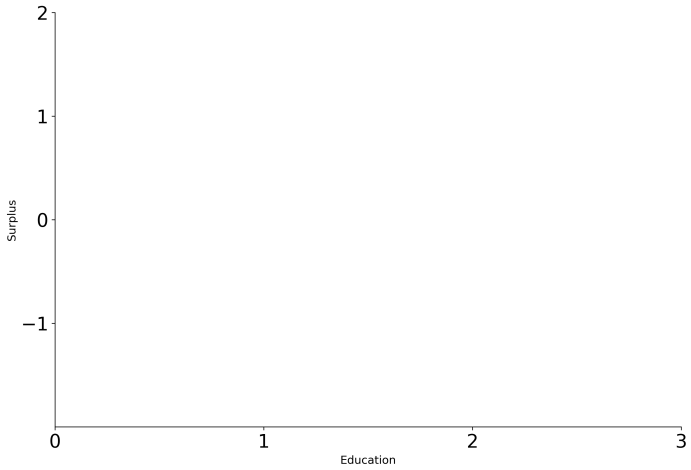
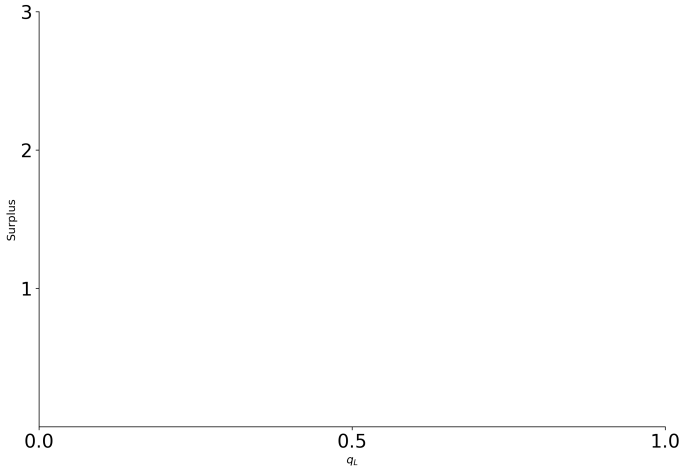


Figure 3: Surplus and market structure



(7) What scenario do high productivity individuals prefer, what does their assessment depend on, when exactly do they change their mind?

3 Static model of educational choice

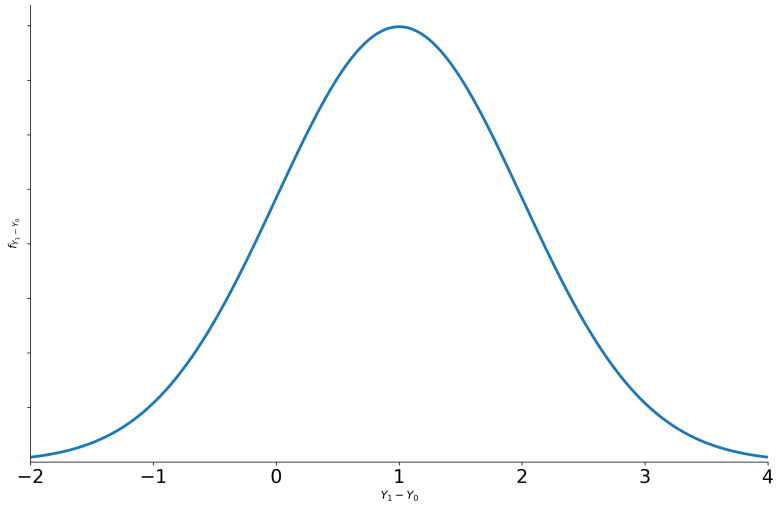
Consider the framework of the generalized Roy model presented in class for the static analysis of educational choice.

(1) Write down and briefly describe the key equations of the model.

(2) Formally define the conventional average treatment effects and describe their limited policy relevance. What is potentially lost by focusing on average effects instead of looking at the whole distribution of individual benefits?

(3) Define and describe the concept of essential heterogeneity. How does its presence and absence affect the relationship between the conventional average treatment effect parameters. Please integrate the conventional average treatment effects in the absence of essential heterogeneity into Figure 4 which already shows a hypothetical distribution of individual-specific benefits.

Figure 4: Distribution of effects

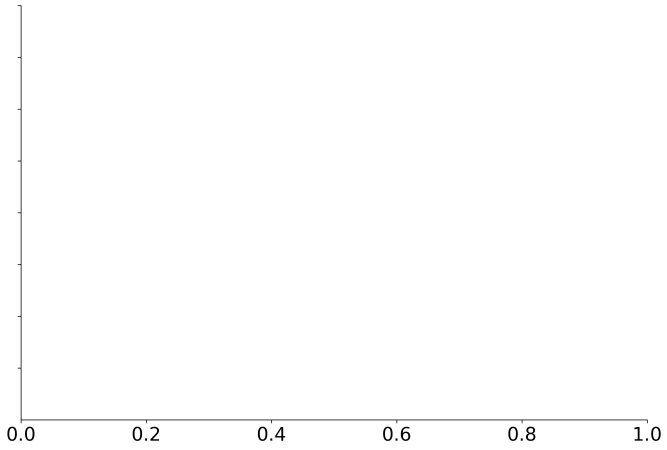


(4) Define and describe the marginal benefit of treatment. What exactly is the conditioning set? Complete the empty canvas below by sketching the marginal benefit of treatment in the presence and absence of essential heterogeneity. Ensure that both axes are properly labeled.

(5) What are the main findings in Carneiro et al. (2011) on the marginal benefit of a college education?

(6) Briefly outline the shortcomings of a static model of educational choice compared to a dynamic model.

Figure 5: Marginal benefit of treatment



Consider the following parameterization of the generalized Roy model presented in class for the static analysis of educational choice.

$$Y_1 = 0.25 \qquad\qquad D = \mathbb{1}[\,0.50 > U\,]$$
$$Y_0 = U$$

Assume that U follows a uniform distribution between zero and one. Please be careful about correctly labeling all graphs that you decide to include in your answers.

(1) Define the individual effect of treatment. What are the sources of heterogeneity in the model. What fraction of individuals have a positive benefit of treatment? How many do select into treatment?

(2) Formally define the conventional average treatment effects and describe their limited policy relevance. How does the distribution of benefits for the model above look like? What is its exact range? Please mark the part of the distribution conditional on treatment status. Calculate the conventional effects of treatment.

(3) Define and describe the concept of essential heterogeneity. Does the parameterized model exhibit essential heterogeneity? Please explain your answer.

(4) Define and describe the marginal benefit of treatment B^{MTE}. How exactly does the B^{MTE} for the parameterized model above look like?

4 Dynamic model of educational choice

Please consider the standard setup of the Mincer returns as presented in class.

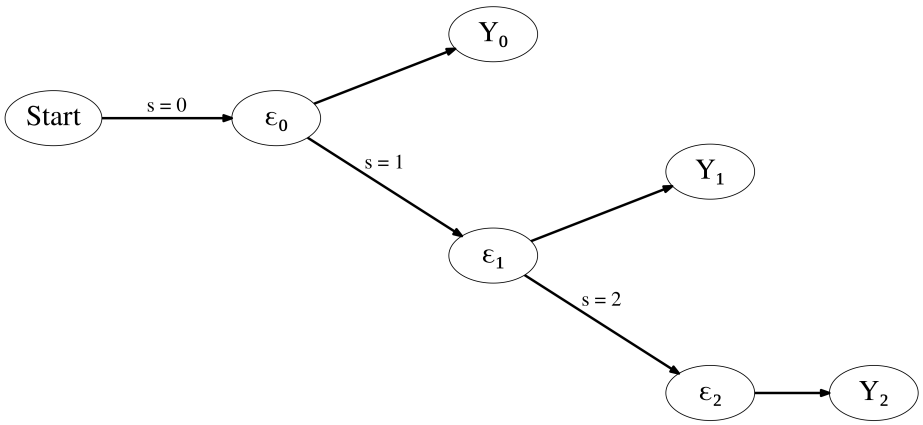
(1) Please state and briefly describe the Mincer equation (Mincer, 1974). What are its key features? What important characteristics of schooling choices are lost when studying Mincer returns? What alternative return concepts exist?

(2) Heckman, Lochner, & Todd (2006) derive several implications of the Mincer equation and put them to the empirical test. Please provide their formal statement and a brief verbal explanation.

Now please consider the sequential model of schooling decisions introduced in class to determine the true return to schooling.

Figure 6 shows the two period decision problem. Individuals enter the model without any schooling and can decide to pursue up to two additional years if they desire to do so. At any point, they can drop out of school and enter the labor market with the following earnings.

Figure 6: Decision problem



$$Y_0 = 0.5 \qquad Y_1 = 1.5 + \epsilon_1 \qquad Y_2 = 1.5$$

Note that not all earnings have a random component. In addition, there is no time-discounting and ϵ_1 follows a uniform distribution between zero and one.

(4) What share of individuals will continue their schooling at each decision node? How does the final distribution of schooling levels look like?

(5) Please provide the formal definition and a brief verbal explanation for the value V_s and true return $R_{s,s-1}$ of a schooling level. For an individual entering the model, what is the value of no schooling V_0 and the true return of the first year $R_{1,0}$?

(6) Please provide the formal definition and a brief verbal explanation of the option value of a schooling level. For an individual entering the model, what is the option value $O_{1,0}$ of the first year of schooling?

References

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