

# Exam

## *Adv. PSE II: Economics of Education*

Wirtschaftswissenschaftliche Fakultät der Friedrich-Schiller-Universität Jena  
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First name:		Last name:	
Student ID number:		Course of study:	

**Please note:**

- (a) The exam consists of 11 pages including this one. Please check whether your copy of the exam is complete.
- (b) The exam consists of 3 questions. The maximum number of points receivable is 60. You have 60 minutes to complete the exam.
- (c) Please answer the questions by writing into the boxes provided after each question. **Do not use your own paper!** Fill your name and student ID number into the form at the top of each page.
- (d) If not defined otherwise, variables have the same meaning as in class. Please make sure that your answers are clearly legible and without any ambiguity. Your answers have to be tractable. If you use diagrams, make sure to label and explain them.
- (e) You may use a calculator, but it must not have a text storage function.
- (f) It is your own responsibility to hand in your copy of the exam to the supervisory staff at the end of the exam.

Question	1	2	3	Sum	Grade
Points receivable	20	20	20	60	
Points received					

**Question 1: Returns to human capital investments** (20 Points)**Question 1(a)** (10 Points)

As you learned in class, returns to human capital investments can be estimated by means of the Mincer Earnings Function.

$$\ln(y) = \beta_0 + \beta_1 t + \beta_2 x + \beta_3 x^2 + \epsilon$$

with:  $t$ : duration of education,  $x$ : experience (=age - duration of education - 6 years) and  $y$ : annual income.

- (a1) Interpret  $\beta_1$  assuming that  $t$  is expressed in years and earnings losses are the only costs of education! (3 Points)

- (a2) Explain why  $\beta_1$  is assumed to be positive! Discuss this assumption with respect to causality and unobserved heterogeneity! (5 Points)

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- (a3) Explain why  $\beta_2$  is assumed to be positive, but  $\beta_3$  is assumed to be negative! (2 Points)

**Question 1(b)** (10 Points)

Hanushek and Wößmann (2008) estimate the effect of human capital on the average GDP per capita growth rate in a cross-country regression with 50 countries over the period 1960–2000. They use pupils' average test scores as a quality measure of human capital.

The table below reports their baseline regression results:

Dependent variable: average annual growth rate in GDP per capita, 1960-2000

	(1)	(2)	(3)*	(4)
GDP per capita 1960	-0.379 (4.24)	-0.302 (5.54)	-0.277 (4.43)	-0.351 (6.01)
Years of schooling 1960	0.369 (3.23)	0.026 (0.34)	0.052 (0.64)	0.004 (0.05)
Test score (mean)		1.980 (9.12)	1.548 (4.96)	1.265 (4.06)
Openness				0.508 (1.39)
Protection against expropriation				0.388 (2.29)
Constant	2.785 (7.41)	-4.737 (5.54)	-3.701 (3.32)	-4.695 (5.09)
<i>N</i>	50	50	50	47
<i>R</i> <sup>2</sup> (adj.)	0.252	0.728	0.741	0.784

Notes: t-statistics in parentheses.

\*Regression includes 5 regional dummies.

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Hanushek and Wößmann interpret the regression output of column (2) in the following way:

*After controlling for the initial level of GDP per capita and for years of schooling, the test score measure features a statistically significant effect on the growth in real GDP per capita in 1960–2000.*

(b1) Explain the problem of reverse causality in this example. How could one test for reverse causality? (4 Points)

(b2) What is omitted-variable bias? Explain how omitted-variable bias could influence the regression results! Use column (4) of Table 1 to state an example! (4 Points)

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- (b3) In the data set 10 out of the 50 countries are Asian countries. Within the last decades several of these countries were characterized by both high education test scores and high economic growth. Ignoring all other possible econometric problems – which problem may arise if one concludes from the regression output that in general higher test scores lead to an increase in GDP growth rates? (2 Points)

**Question 2: Political Economics** (20 Points)

Question 2 refers to a model of political-economy aspects which was discussed in class:

The model has two periods. There is a unit measure of households indexed by  $i$  in the economy, each consisting of a parent and a child where all decisions are made by the parent. Households differ in their incomes with  $y_i$  exogenously given and  $y_m < \bar{y}$ , where  $y_m$  denotes median income and  $\bar{y}$  denotes average income. Parent's utility is given by the logarithmic function

$$U(c_i, s_i) = \ln c_i + \delta \ln s_i \quad \text{with } \delta > 0$$

with  $c_i$  denoting consumption and  $s_i$  denoting school spending per student.

The individual budget constraint is

$$y_i = c_i + s_i.$$

Credit constraints prevent parents from borrowing against future earnings of their children.

**Question 2(a)** (3 Points)

Describe the political-economy problem that is considered in this model with respect to voter preferences **in one or two sentences!**

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**Question 2(b)** (8 Points)

What is the optimal (utility maximizing) level private-school spending  $s_i$ ? Interpret your result **in one sentence!**

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Now consider the case where a uniform level of education is financed in a purely public way via a proportional income tax  $\tau$ . The individual budget constraint is then given by

$$c_i = (1 - \tau)y_i$$

and the public budget constraint is

$$s_i = \tau \bar{y}$$

**Question 2(c)** (9 Points)

Derive the tax rate  $\tau^*$  preferred by a parent with income  $y_i$ ! Interpret your result **in one sentence!**



### Question 3: Multiple Choice Questions (20 Points)

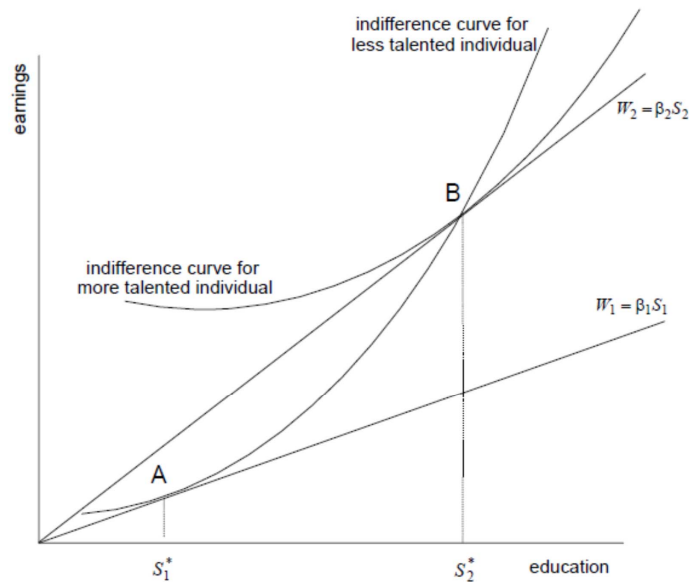
You will be **awarded one point** for every statement that is marked correctly. **One point will be subtracted** for every statement that is marked incorrectly. Unmarked answers will be ignored. The minimum total number of points for question 3 is zero.

#### Question 3(a) Signaling and Screening (5 Points)

The following five items relate to the signaling and screening approach that was discussed in class.

True	False	
<input type="checkbox"/>	<input type="checkbox"/>	In the signaling model, the benefits of education are greater than the costs only for talented workers, so only workers with a high ability will obtain education.
<input type="checkbox"/>	<input type="checkbox"/>	With imperfect information (without signaling) a risk-neutral firm will pay the workers a wage according to their individual marginal product.
<input type="checkbox"/>	<input type="checkbox"/>	If the “Incentive Compatibility Constraint” holds, this implies that all talented workers obtain education while all untalented workers have no incentive to choose education.

Consider the following figure!



True	False	
<input type="checkbox"/>	<input type="checkbox"/>	The figure displays a separating equilibrium since talented and untalented workers choose different levels of education.
<input type="checkbox"/>	<input type="checkbox"/>	Assuming that there is a screening device with fixed screening costs a separating equilibrium exists if talented people have no incentive to undertake screening.

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**Question 3(b) Externalities in a closed economy (5 Points)**

The following five items relate to the model of Stark and Wang (2002) and some empirical evidence that was discussed in class.

True False

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<input type="checkbox"/>	<input type="checkbox"/>	In the presence of a positive externality individuals overinvest in education since they do not internalize social returns.
<input type="checkbox"/>	<input type="checkbox"/>	Net earnings per worker attained under the social planner's choice of optimal human capital are higher than those achieved when workers choose how much human capital to form without taking into consideration the human capital externality (market failure).
<input type="checkbox"/>	<input type="checkbox"/>	It can be shown that a combination of public subsidies and taxes is a possibility to correct for the identified market failure.
<input type="checkbox"/>	<input type="checkbox"/>	Migration opportunities, i.e. a positive probability of migration, have a positive effect on investment incentives (human capital inducement effect) such that open borders can be seen as a (costless) substitute to subsidies.
<input type="checkbox"/>	<input type="checkbox"/>	Finding that average wages react to changes of human capital (e.g., the share of college graduates in the labor force) can be considered proof of a spill-over effect.

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**Question 3(c) Financing of higher education (open borders) (5 Points)**

The following five items relate to models of Justman and Thisse (2000) and Lange (2009) that were discussed in class. It is assumed that higher education is publicly funded by a lump-sum tax.

First assume that only skilled workers are mobile:

True False

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<input type="checkbox"/>	<input type="checkbox"/>	In the centralized solution total (federal) output net of education costs is maximized if the marginal product of skilled human capital equals the marginal costs of training.
<input type="checkbox"/>	<input type="checkbox"/>	Decentralized maximization of local output leads to less local expenditure (underinvestment) on education than global output maximization.
<input type="checkbox"/>	<input type="checkbox"/>	The extent of underprovision depends on the workers' responsiveness to wage differentials. The shortfall is smaller the more strongly migration responds to wages.

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Now assume that both students and high skilled workers are mobile:

True False

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|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | A country might overinvest in education by means of increasing education quality to attract students, that is possible future high skilled workers.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Austria is a comparatively large net importer of foreign students (inflow exceeds outflow). Given that most of the foreign students return to their home country after graduation and given that there is no compensation via an inflow of foreign workers, Austria has an incentive to reduce the public share of higher education finance. |
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**Question 3(d) Human capital and growth (5 Points)**

True False

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|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | The micro perspective (Mincer model) implies that the change in a country's average level of education should be the key determinant of income growth.   |
| <input type="checkbox"/> | <input type="checkbox"/> | On the micro level the effects of human capital on growth are usually measured by means of the changes in earnings.  |
| <input type="checkbox"/> | <input type="checkbox"/> | In neoclassical growth models steady-state growth does not depend on human capital; human capital only changes the transition to the new income levels.  |
| <input type="checkbox"/> | <input type="checkbox"/> | In endogenous growth models long-term growth can be due to the existing stock of human capital that generates innovations. The larger the human capital of researchers, the higher the rate of innovation and the total growth rate. |
| <input type="checkbox"/> | <input type="checkbox"/> | In endogenous growth models long-term growth can be due to the accumulation of human capital that improves a country's ability to imitate and adapt new technology which leads to technological progress and sustained growth.       |
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