Returns to Education in Developed and Developing Countries

EE473

- Earnings differentials by level of education reflect the monetary incentives for someone to invest in education
- Earnings differentials by education represent the intersection of supply and demand curves for educated labor
- Differences in relative earnings between countries reflect a number of factors, for example, the demand for skills in the labor market, minimum wage legislation, the strength of unions, collective agreements, the supply of workers with various levels of educational attainment, the work experience of workers with high and low levels of schooling, the distribution of employment among occupations, and the relative incidence of part-time and seasonal work

Glossary

Ability bias

Causal returns

Endogeneity of education

Measurement error

Instrumental variables

Returns to education

Selection bias

Sheepskin effect

Social returns to education

Ability bias

- The bias is to the returns to schooling that can result form the fact that people who acquire more education may have greater innate skills that would allow them to earn more even without additional schooling
- Individuals may differ by innate ability, motivation, organizational skills, entrepreneurship, time-management skills, and willingness to work hard
- To the extent that these factors lead to higher earnings as well as higher education, and they are not accounted for in the statistical analysis, then omitting them from the estimating equation means that some the higher returns to education may be reflecting the effect of these factors

Causal returns

- The returns to education that are induced or caused by additional education rather than simply correlated or associated with additional education

Endogeneity of education

- The fact that education is a decision variable in that the amount of education acquired may be a function of factors such as ability, motivation, family background, income, proximity to school, and compulsory school laws

Instrumental variables

Instrumental variables are variables that affect the amount of education acquired but do not affect the education outcomes or the returns to education

- Compulsory school laws
- Proximity to schools

Measurement error

- The possibility that collected data, like education, may be measured with error since people may not accurately report their education
- If the misreporting is random or unrelated to the level of education, then such classical measurement error leads to a downward bias in the estimated returns to education
- If the misreporting is systematically related to the level of education, then the bias can go in either direction
- Card(1999) concludes that measurement error in education leads to a downward bias in returns to education, with the estimated returns understating the true returns by about 10%- that is, if the estimated returns were 0.10, the true returns would be 0.11

Returns to education

- The financial rate of return to investing in an additional year of schooling, obtained by comparing the additional earnings from an additional year of education with the cost of acquiring the additional education – it shows how average earnings increase with added education

Selection bias

- It is the bias that can be created by the fact that education may be a function of conventionally unobserved factors such as ability or motivation

Sheepskin effect

- The credential effect or additional returns associated with the credential of completing key phases of education like graduating from high school or university (sheepskin was used historically to make the parchment for diploma)

Social returns to education

- A positive externality and its existence justifies government involvement in the promotion of education
- Citizenship
  - an educated citizenry is often argued to be necessary for a functioning democracy
  - Milligan et al. (2004) find that schooling increases civic participation in the United States – they find that higher levels of education are positively associated with individual awareness of campaign issues and that educated individuals are generally more involved in the political process

- Crime
  - the reduction in crime due to higher education level is de facto an externality of education
  - Crime usually involve opportunity-cost arguments - individuals with few marketable skills have a low opportunity cost in the commission of crime and in the possible time cost of incarceration
  - Property and violent crimes increases through adolescence for males, peaks in the late teens, and declines markedly thereafter
  - White-collar crime tends to require some what more sophistication, peaks at a much later age and the declines more slowly
  - Lochner and Moretti (2004) attempts to measure the causal effect of schooling on crime activity
    - they estimate that an extra year of schooling results in a 0.37 percentage point reduction in the probability of incarceration for blacks, and a 0.10 percentage point reduction for whites
    - They estimate that the social savings per additional high school graduate is between US$1170 and US$2100

- Health
  - Vaccinating an individual against communicable diseases benefits the individual (a private return), but also lowers the incidence of the disease in the population (a social return)
  - If education has a causal effect that increases vaccination rates, this would imply the existence of an externality – although a strong positive correlation exists between education and vaccination rates, a definitive causal link has not been established

- What are the private returns that individuals can expect from investing in education?
- How do those returns vary by factors such as level of education, field of study, and individual background characteristics?
  - Estimates of the private returns to education build on the human capital earnings function of Mincer (1974)
  - Estimates from a basic Mincer schooling equation tend to yield estimates around 0.07 – 0.10, being slightly higher for females and lower for males
  - The returns are slightly higher for general academic streams compared to technical vocational streams
  - The returns are higher in the more professional fields like engineering, medicine, business, and sciences and lower in social sciences and humanities

- Is there an extra effect from a year of education if that year provides the credential of completing a phase of study such as graduating from high school or university?
  - The returns to an additional year of education that involves completion of a stage (e.g. graduating from high school, or university) is higher than the return to a year of education that does not involve the credential of the completion of a phase
  - Ferrer and Riddell (2002) based on the 1996 Canadian census, they estimate rates of return to an additional year of schooling to be 6% for males and 9% for females. When the returns to completing the phases are calculated and annualized over the period of education necessary to complete the degree, the annual rates of return that are implied by completing university relative to high school are 9% for males and 11% for females.

- If potential dropouts are compelled to stay in school longer by compulsory school laws do they receive returns that are higher or lower than the average returns?
  - Differences in compulsory school laws and changes to these laws over time can generate differences in education attainment since some persons in jurisdictions with higher ages at which it is compulsory to remain in school will acquire more education because they cannot drop out until the compulsory age (Oreopoulos, 2006)
  - Card (1999 &2001), many of the natural experiments used to estimate returns to education identify average returns for more disadvantaged groups

- Are the returns the result of education enhancing the productivity and skills of individuals or are they the result of signaling of such conventionally unobserved factors such as ability, motivation, and time-management skills?
  - There is a fundamental difficulty in unraveling the extent to which schooling is a signal of existing productivity as opposed to enhancing productivity: both theories are observationally equivalent – they both suggest that there is a positive correlation between earnings and schooling, but for different reasons
  - If early job placements influence long term job opportunities, the effects of signaling can be long-lasting
  - Evidence of signaling or sheepskin effects- Weiss (1995), Chatterji et al. (2003)

- What are the appropriate methodologies for estimating the returns to education, especially for dealing with factors such as measurement error, ability bias, credential effects, and financial constraints?
- The causal returns to education after controlling for other observable and unobservable factors like innate ability or motivation that may affect the outcomes associated with higher education
- Understanding the underlying causal relationship process is important for policy purposes so as to ascertain the effect of policy interventions
  - To reallocate resources from fields of low returns to fields of high returns or raise the age of compulsory schooling or institute policies to deter dropping out

Illustrative estimates of returns to education using alternative approaches

Author	General Method	Sample	Returns to education
Grilliches (1997)	Regression log median earnings of expected occupation at age 30 on schooling while using IQ score as additional proxy control for ability	17-27 year old men in 1969 from US National Longitudinal Survey for Young Men, using log median earnings of expected occupation at age 30	0.059(0.003)
Ashenfelter and Rouse (1998)	Regression difference in log earnings between identical twins on difference in schooling	1991-93 Princeton Twins Survey of identical twins	0.102(0.010)
Card (1995)	Use indicator for whether living near a 4-year college as an IV for predicting schooling	US Longitudinal Survey for Young Men	0.132(0.049)
Chen (2008)	Use average tuition fees at the local college in county as instruments for predicting schooling	25-42 year old men in 1979-2000 from US National Longitudinal Survey for Youth, 1979	0.133(0.028)
Oreopoulos (2006)	Use differences in state compulsory schooling laws as instruments for predicting schooling	25-64 year old men and women in 1950-2000 US Censuses	0.142(0.012)
Bezil and Hanson (2007)	Construct structural model on education attainment decisions and estimate model along with returns to schooling	White males from the US National Longitudinal Survey of Youth	0.069(average between grade 10 and 16)

- Returns to education tend to be in the neighborhood of 10%, typically ranging from 6% to 15%
- Returns to education tend to be in the 6-10% range when based on OLS estimates from conventional schooling equations and the 10-15% range (and sometimes higher) when based on instrument variables (IV) and other procedures used to identify exogenous variation in education
- The returns tend to be higher for

1. Females as opposed to males
2. Obtaining the credentials associated with completing phases like high school or university
3. General academic streams compared to technical vocational streams
4. Professional fields like engineering, medicine, business, and sciences and lower in social sciences and humanities and especially fields like fine arts

- The returns tend to be increasing over time in spite of the large increases in the supply of educated persons, highlighting that the demand for education associated with the knowledge economy and the widening of the skilled – unskilled wage differential are outstripping the supply responses

Returns to Investment in Education: A Global Update

PSACHAROPOULOS, G. (1994)

WORLD DEVELOPMENT

- Provide a comprehensive update of the profitability of investment in education at a global scale
- The returns **decline** by the level of schooling and the country's per capita income
- Investment in women's education is in general **more profitable** than that for men
- Returns in the private competitive sector of the economy **are higher** than among those working in the public sector
- The public financing of higher education is **regressive**
- Investment in education continues to be a very attractive investment opportunity in the world today –both from the private and the social point of view

Methodological Issues

The Full or Elaborated method

- Detailed age-earnings profiles by level of education and finding the discount rate that equates a steam of education benefits to a stream of education costs at a given point in time

The earnings function method

- Mincer (1974) and involves the fitting of a semi log OLS regression using the natural logarithm of earnings as the dependent variable, and years of schooling and potential years of labor market experience and its square as independent variables
- The extended earnings function method can be used to estimate returns to education at different levels by converting the continuous years of schooling variable into a series of dummy variables referring to the completion of the main schooling cycles

Table 1. *Returns to investment in education by level (percentage) full method, latest year, regional averages*

Country	Social			Private		
	Prim.	Sec.	Higher	Prim.	Sec.	Higher
Sub-Saharan Africa	24.3	18.2	11.2	41.3	26.6	27.8
Asia*	19.9	13.3	11.7	39.0	18.9	19.9
Europe/Middle East/North Africa*	15.5	11.2	10.6	17.4	15.9	21.7
Latin America/Caribbean	17.9	12.8	12.3	26.2	16.8	19.7
OECD	14.4	10.2	8.7	21.7	12.4	12.3
World	18.4	13.1	10.9	29.1	18.1	20.3

Source: Table A-1.
*Non-OECD.

Table 2. *Returns to investment in education by level (percentage) full method, latest year, averages by per capita income group*

Country	Mean per capita (US$)	Social			Private		
		Prim.	Sec.	Higher	Prim.	Sec.	Higher
Low income ($610 or less)	299	23.4	15.2	10.6	35.2	19.3	23.5
Lower middle income (to $2,449)	1,402	18.2	13.4	11.4	29.9	18.7	18.9
Upper middle income (to $7,619)	4,184	14.3	10.6	9.5	21.3	12.7	14.8
High income ($7,620 or more)	13,100	n.a.	10.3	8.2	n.a.	12.8	7.7
World	2,020	20.0	13.5	10.7	30.7	17.7	19.0

Source: Table A-1.

World Pattern
Table 1 & Figure 1

- Primary education continues to exhibits the highest social profitability in all world regions
- The lowest social rate of return average referring to higher education in OECD countries is close to the long-term opportunity cost of capital – the profitability of human and physical capital at the margin has reached virtual equilibrium
- Private returns are considerably higher than social returns because of the public subsidization of education
- The degree of public subsidy increases with the level of education considered, which has regressive policy implications

Diminish Returns
Table 2 -4and Figure 2 - 5

- Social and private returns at all levels largely decline by the level of the country's per capita income - reflection of the law of diminishing returns to the formation of human capital at the margin
- The same overall declining pattern is detected regarding the Mincerian returns to education

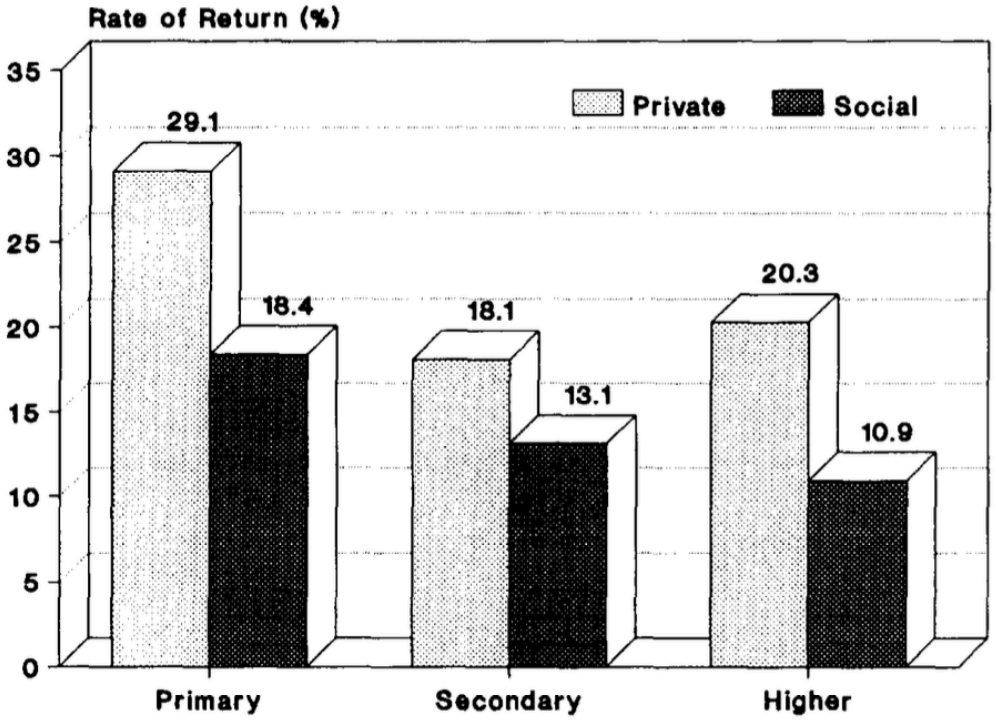


Figure 1. *Returns to investment in education by level, latest year.*

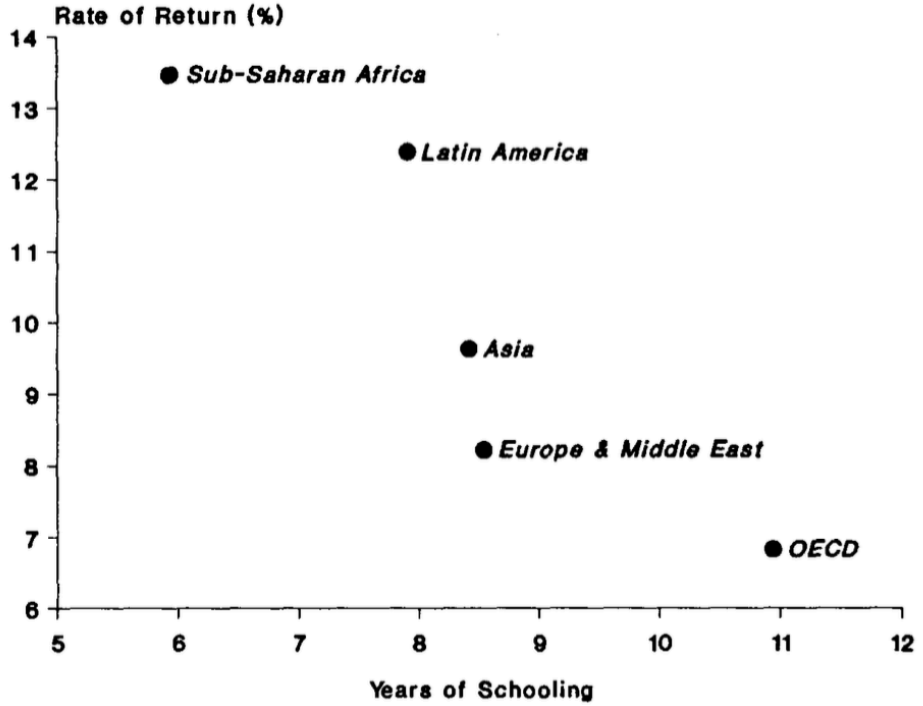


Figure 2. *Mincerian returns and mean years of schooling.*

Table 3. *The coefficient on years of schooling: Mincerian mean rate of return*

Country	Mean per capita income (US$)	Years of schooling	Coefficient (percent)
Low income ($610 or less)	301	6.4	11.2
Lower middle income (to $2,449)	1,383	8.4	11.7
Upper middle income (to $7,619)	4,522	9.9	7.8
High income ($7,620 or more)	13,699	10.9	6.6
World	3,665	8.7	10.1

Source: Table A-2.

Table 4. *The coefficient on years of schooling: Mincerian rate of return (regional averages)*

Country	Years of schooling	Coefficient (percent)
Sub-Saharan Africa	5.9	13.4
Asia*	8.4	9.6
Europe/Middle East/North Africa*	8.5	8.2
Latin America/Caribbean	7.9	12.4
OECD	10.9	6.8
World	8.4	10.1

Source: Table A-2.
*Non-OECD.

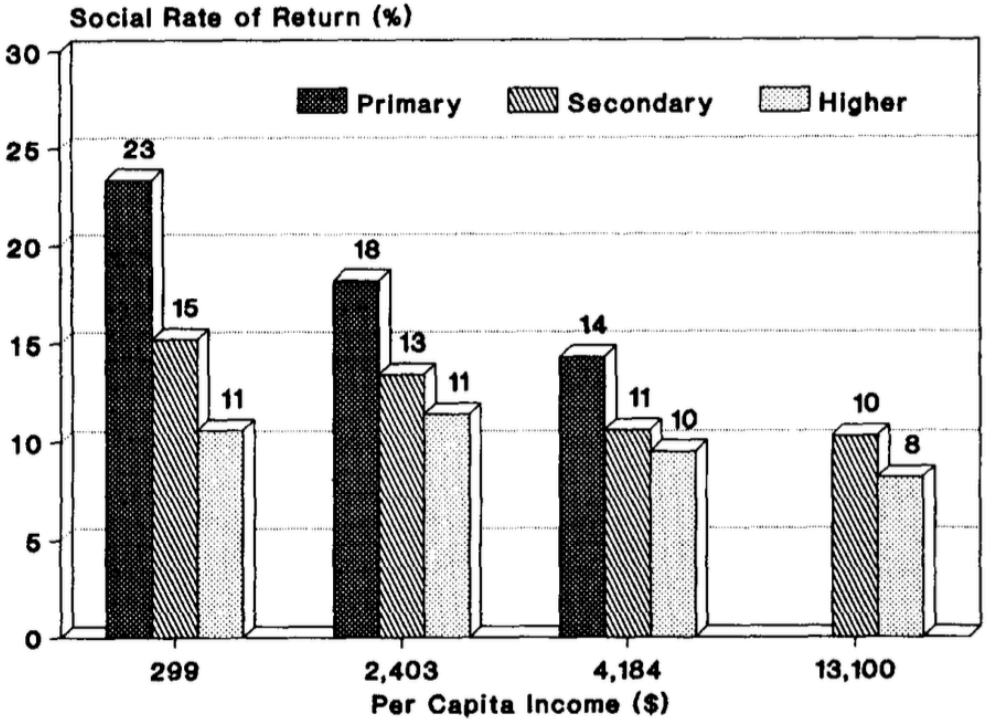


Figure 3. *Social returns to investment in education by income level.*

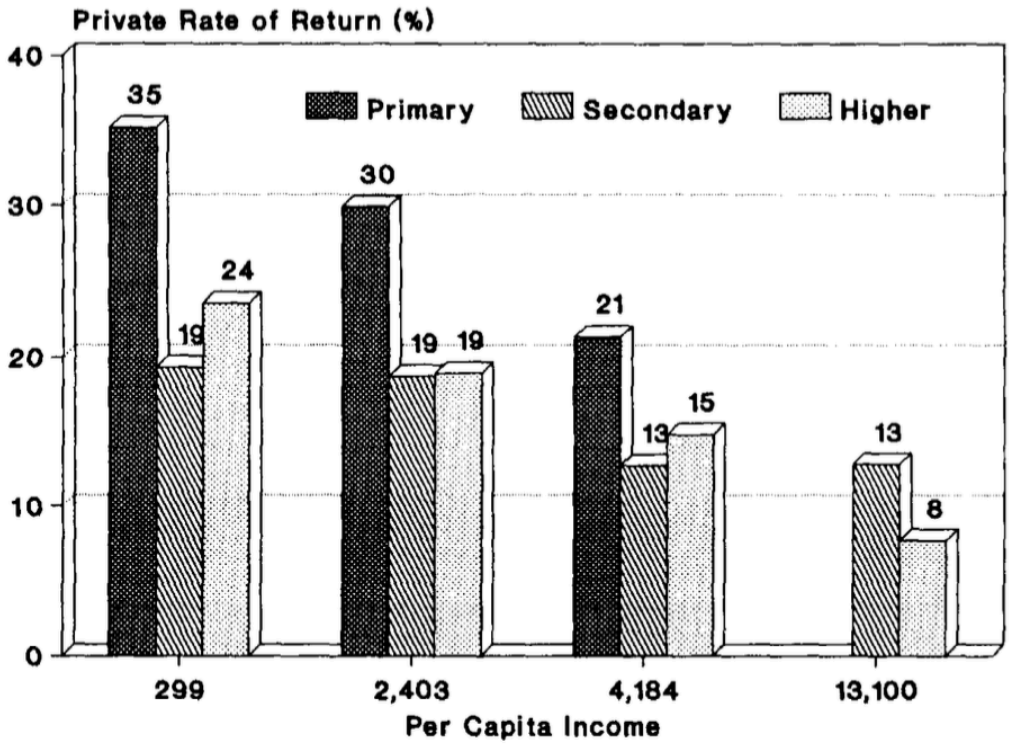


Figure 4. *Private returns to investment in education by income level.*

Males vs. Females
Table 7 and Figure 6

- The returns to female education are higher than those for males
- Individual levels of education show a more mixed pattern

Secondary school curriculum Table 9 and Figure 7

- One type of vocational education that has been singled out as an issue, is the separate vocational/technical track of secondary schools (McMahon 1988)
- Table 9 & Figure 7 confirms the earlier finding that the returns to the academic/general secondary school track are higher than the vocational track
- The difference between the profitability of the two subjects is more dramatic regarding the social returns because of the much higher unit cost of vocational/technical education

Psacharopoulos and Verez (1992)

- Using Columbia data – found a strong positive interaction between training and years of formal education in determining earnings
- They found that training really has an effect on earnings after a worker has 8 years of fomal education

Mingat and Tan (1988)

- Examined the economics of traning provided under 115 physical capital investments
- They found that such training was particularly productive when a country's educational system is highly developed

Table 7. *Returns to education by gender (percentage)*

Educational level	Men	Women
Primary	20.1	12.8
Secondary	13.9	18.4
Higher	13.4	12.7
Overall*	11.1	12.4

Source: Table A-3 (available from the author).
*Mincerian method.

Table 9. *Returns to secondary education by curriculum type (percentage)*

	Rate of return	
Curriculum type	Social	Private
Academic/General	15.5	11.7
Technical/Vocational	10.6	10.5

Source: Tables A-5 (Available from the author).

Higher education faculty
Table 10

A large variation between the returns to higher education faculties, the lowest social returns being for physics, sciences and agronomy, and the highest private returns for engineering, law and economics

Sector of employment
Table 11 and Figure 8

- The returns in the private/competitive sector of the economy are higher than for those who work in the public/non-competitive sector

Table 10. *Returns to higher education by faculty (percentage)*

Subject	Social	Private
Agriculture	7.6	15.0
Soc. Science, Arts & Human.	9.1	14.6
Economics & Business	12.0	17.7
Enginering	10.9	19.0
Law	12.7	16.8
Medicine	10.0	17.7
Physics	1.8	13.7
Sciences	8.9	17.0

Source: Table A-6 (available from the author).

Table 11. *Returns to education by economic sector (percentage)*

Economic sector	Rate of return
Private	11.2
Public	9.0

Source: Table A-7 (available from the author).

Table 12. *Returns to education in self vs. dependent employment (percentage)*

Employment type	Rate of return
Self employment	10.8
Dependent employment	12.2

Source: Table A-8 (available from the author).

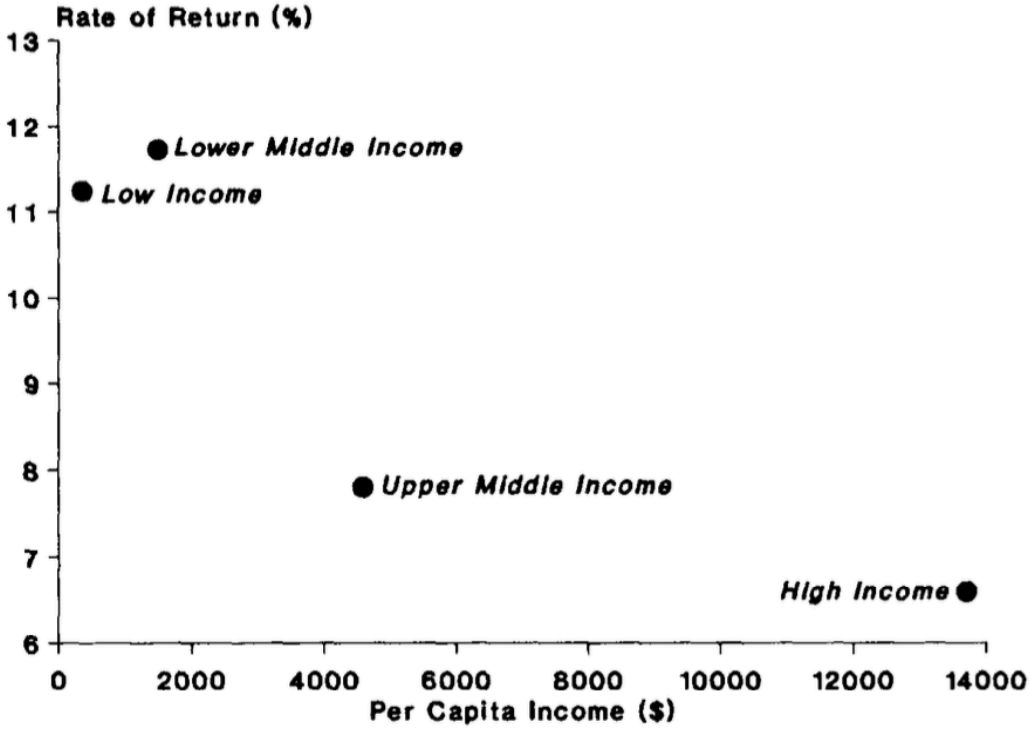


Figure 5. *Mincerian returns by income level.*

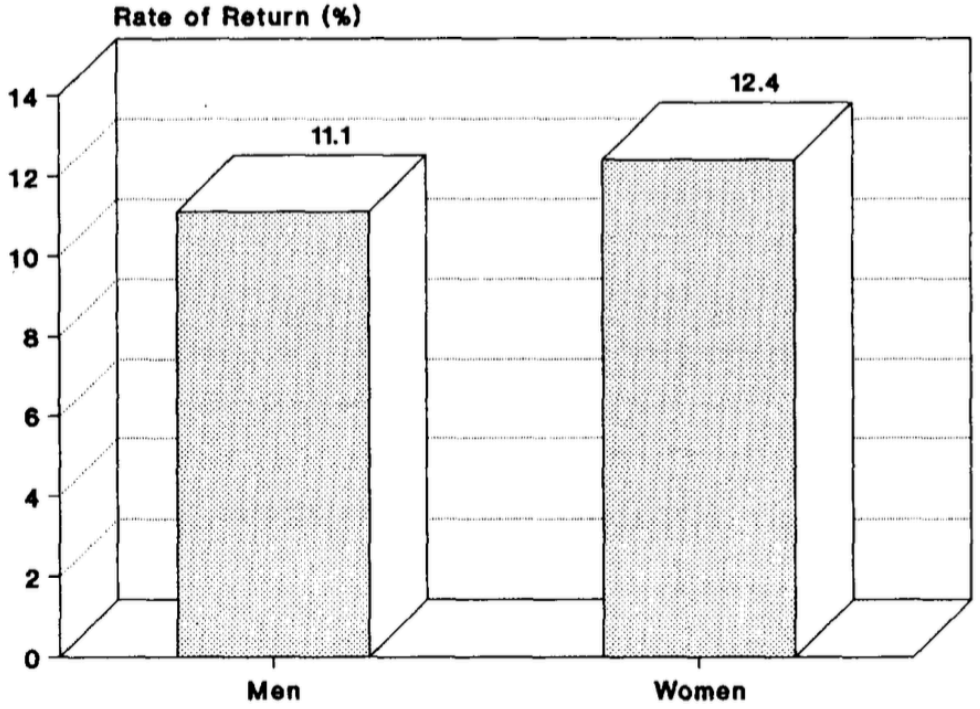


Figure 6. *Mincerian returns to education by gender.*

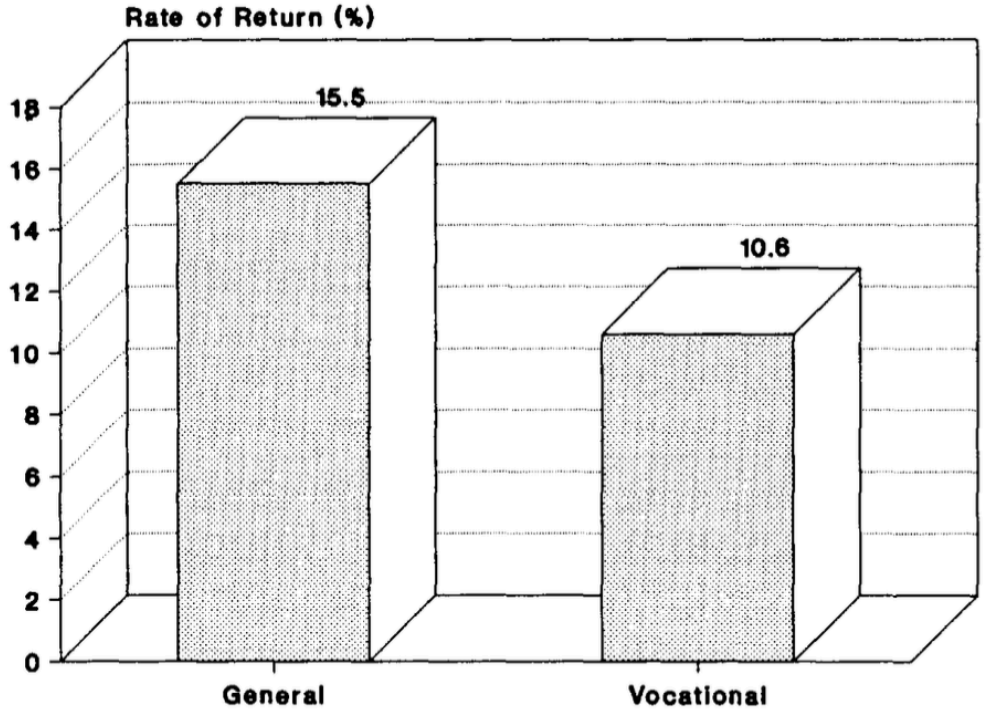


Figure 7. *Social returns to secondary education by curriculum type.*

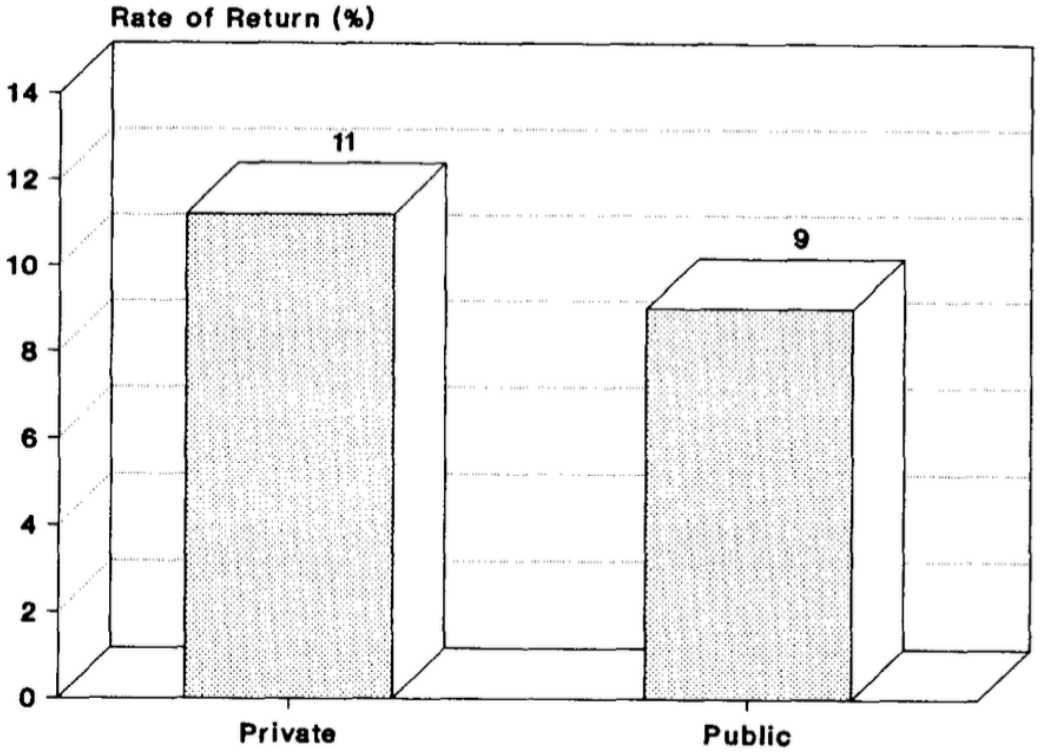


Figure 8. *Returns to education by sector employment.*

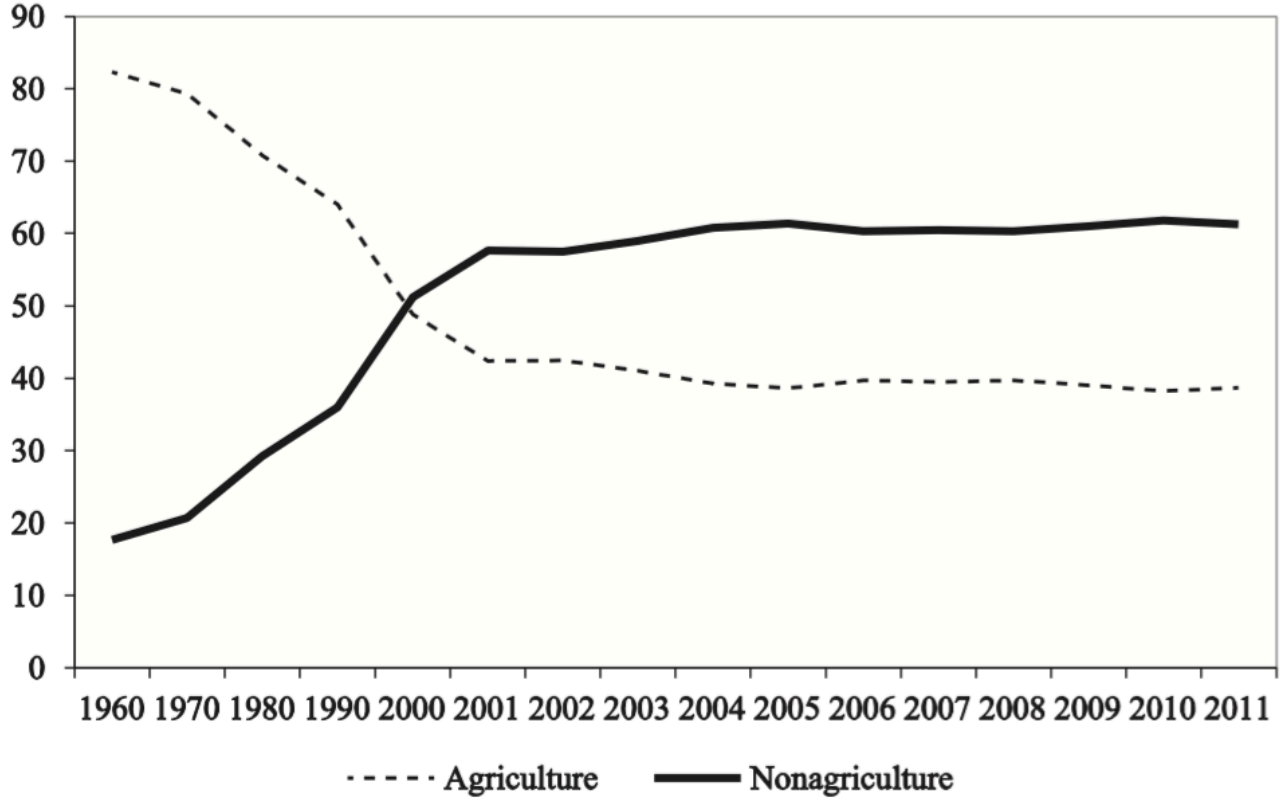
Rates of Return to Schooling in Thailand

TANGTIPONGKUL, K. (2015)

ASIAN DEVELOPMENT REVIEW

- This paper examines the rates of return to schooling
- Using 2007–2010 data from Thailand's National Labor Force Survey
- The Mincer-type rate of return to investment in schooling was estimated
- The rates of return to schooling for work experience are significantly positive, but at a decreasing rate
- Region of residence and variation in gross provincial product per capita are significant factors in determining the private rate of return
- The rates of return to schooling by type of industry reveal higher earnings in mining, utilities, construction, manufacturing, and services than in agriculture
- The private and social returns on vocational secondary education attainment are greater than on general secondary education
- Finally, the private returns on university attainment for women exceed men by about 1.5 percentage points.

Figure 1. **Sectoral Shares of Employment**



Sources: Adapted from Krongkaew, M. and N. Kakwani. 2003. The Growth–Equity Trade-Off in Modern Economic Development: The Case of Thailand. *Journal of Asian Economics.* 14 (5). pp. 735–57; Tinakorn, P. 2002. Income Inequalities during Four Decades of National Development: 1961–2001. *Thammasat Economic Journal.* 20 (2/3). pp. 141–208; Figures for 2001–2011 are from the Government of Thailand, National Statistical Office. http://web.nso.go.th/

The regressions are based on Mincer (1974)

$$\ln W_i = \gamma_1 + \gamma_2 Yrs\ of\ schooling_i + \beta_4 E_i + \beta_4 E_i^2 + u_i \quad (1)$$

where $\ln W_i$ is the log of monthly earnings of individual i, $Yrs\ of\ schooling_i$ represents years of schooling of individuals, E_i is a potential year of working experience of individual i, E_i^2 is a potential year of working experience squared, and u_i is the random disturbance term.

An extended earnings function which replaces $Year\ of\ schooling_i$ with levels of schooling and individual characteristics is shown in equation (2):

$$\ln W_i = \beta_1 + \beta_2 X_i + \beta_3 S_i + \beta_4 E_i + \beta_4 E_i^2 + u_i \quad (2)$$

The internal rate of return of education is estimated in terms of both private and social rate of returns. The private rate of return is used to describe the demand for education and assess the equity effects of public education expenditures (Psacharopoulos 1994, 1995). On the other hand, the social rate of return reviews the costs and benefits of the education investment from the government's viewpoint (Psacharopoulos 1994, 1995). Psacharopoulos (1995) states that a key assumption in a social rate of return calculation is that observed wages are a good proxy for the marginal product of labor, especially in a competitive economy using data from the private sector of the economy. The first method to compute the private rate of return to an investment in a given level of education is finding the rate of discount (r) that equalizes the stream of discounted benefits to the stream of costs at a given point in time as shown in equation (3):

$$\sum_{t=1}^{38} \frac{(W_U - W_s)_t}{(1+r)^t} = \sum_{t=1}^{4} (W_S - C_U)_t \, (1+r)^t \qquad (3)$$

where $W_U - W_s$ is the earnings differential between a university graduate (subscript U) and a secondary general school graduate (subscript s, the control group), C_U represents the direct costs of university education (e.g., tuition, fees, books), and W_s denotes the student's foregone earnings or indirect costs (Psacharopoulos 1995).

The second method is the shortcut method to approximate the private returns to education based on Psacharopoulos (1995):

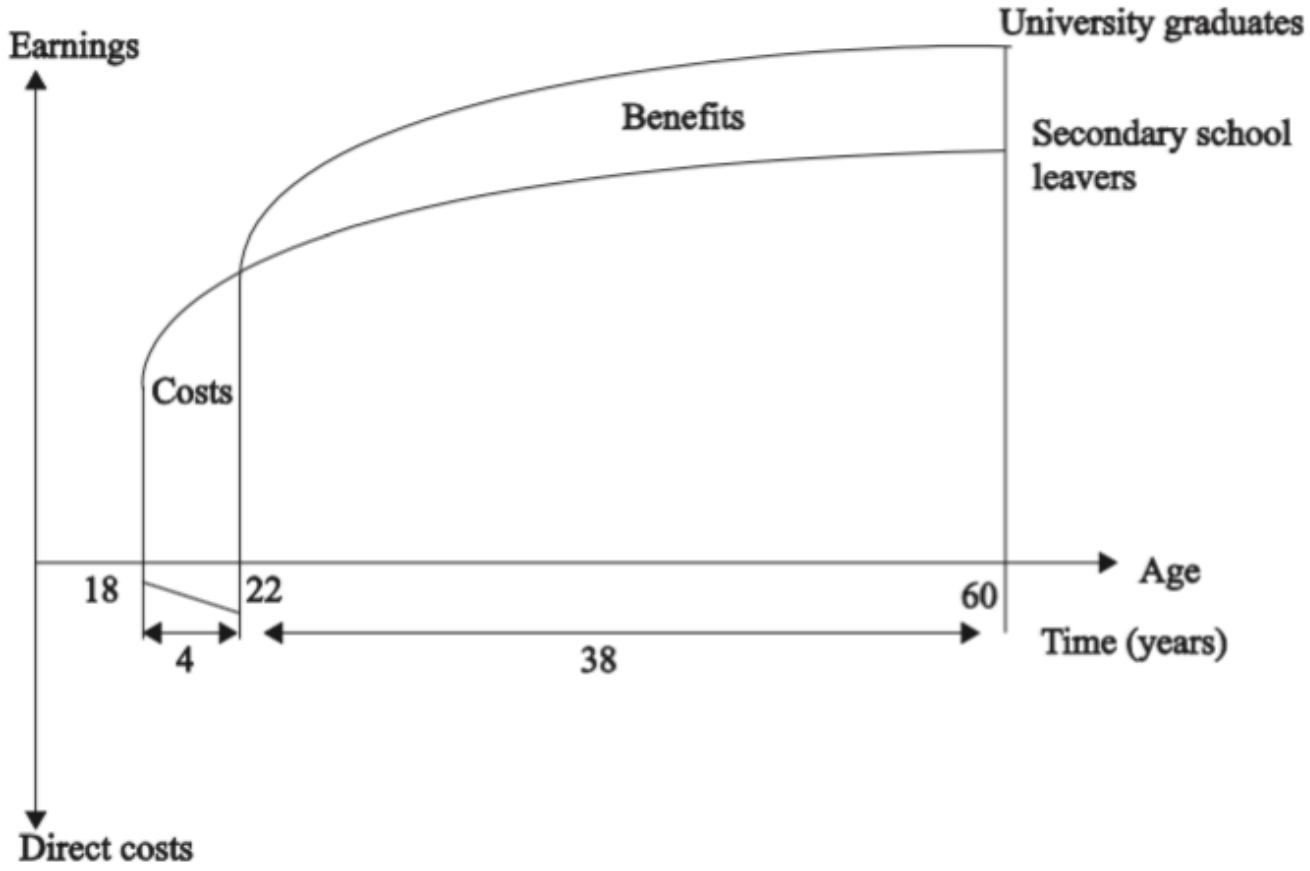
$$private\ r = \frac{\bar{W}_U - \bar{W}_s}{4(\bar{W}_s)} \tag{4}$$

where $\bar{W}$ refers to the mean earnings of an individual with the subscripted education level, $\bar{W}_U$ is the mean earnings of an individual with a university education, $\bar{W}_s$ is the mean earnings of an individual with a general secondary education, and 4 years is the length of the university cycle. The social rate of return in this case is shown in equation (5):

$$social\ r = \frac{\bar{W}_U - \bar{W}_s}{4(\bar{W}_s + C_U)} \tag{5}$$

where C_U is the annual direct cost of university education.

Figure 2. **Stylized Age–Earnings Profiles**



Source: Adapted from Psacharopoulos, G. 1995. The Profitability of Investment in Education: Concepts and Methods. Human Capital Development and Operations Policy Working Paper No. 15280. Washington, DC: World Bank.

Table 6. **Mincer-Type Returns to Education**

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
Constant	6.8274***	6.8884***	6.8628***	6.9836***
	(0.0098)	(0.0098)	(0.0093)	(0.0098)
Years of schooling	0.1376***	0.1337***	0.1322***	0.1263***
	(0.0005)	(0.0005)	(0.0005)	(0.0006)
Experience	0.0501***	0.0503***	0.0514***	0.0506***
	(0.0007)	(0.0006)	(0.0006)	(0.0006)
Experience squared	−0.0006***	−0.0006***	−0.0006***	−0.0006***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.4497	0.4577	0.4601	0.4575

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

Table 7. **Determinants of Earnings (dependent variable: log monthly earnings)**

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
Constant	8.2439***	8.3047***	8.3176***	8.4071***
	(0.0049)	(0.0051)	(0.0049)	(0.0049)
Education attainment				
Primary education	0.1403***	0.1319***	0.1175***	0.1065***
	(0.0070)	(0.0070)	(0.0066)	(0.0069)
Lower secondary	0.3549***	0.3223***	0.2881***	0.2698***
	(0.0076)	(0.0076)	(0.0074)	(0.0072)
Upper secondary	0.5098***	0.4754***	0.4373***	0.4071***
	(0.0088)	(0.0084)	(0.0079)	(0.0083)
Secondary vocational	0.8165***	0.7445***	0.6937***	0.6442***
	(0.0117)	(0.0114)	(0.0122)	(0.0127)
Higher vocational	0.9015***	0.8494***	0.8112***	0.7586***
	(0.0099)	(0.0103)	(0.0096)	(0.0096)
Diploma	0.9417***	0.8324***	0.8667***	0.8014***
	(0.0508)	(0.0503)	(0.0442)	(0.0470)
Bachelor's	1.3888***	1.3404***	1.2997***	1.2371***
	(0.0071)	(0.0071)	(0.0070)	(0.0072)
Master's or higher	2.0688***	1.9743***	1.9650***	1.8829***
	(0.0147)	(0.0122)	(0.0119)	(0.0147)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.4071	0.4152	0.4145	0.4101

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

Table 8. **Returns to Education in Thailand: Extended Earnings Function Method (%)**

Education Level	2007	2008	2009	2010
Primary	2.3	2.2	1.9	1.8
Secondary (General)	6.2	5.7	5.3	5.0
Secondary (Vocational)	11.3	10.2	9.6	8.9
Bachelor's	21.9	21.6	21.6	20.8

Note: Computations are based on extended earnings function method described in Psacharopoulos, G. 1995. The Profitability of Investment in Education: Concepts and Methods. Human Capital Development and Operations Policy Working Papers No. 15280. Washington, DC: World Bank.

Table 9. **Determinants of Earnings (dependent variable: log monthly earnings)**

Explanatory Variable	Log Monthly Earnings 2007	2008	2009	2010
Constant	5.3086***	5.4360***	5.4913***	5.608***
	(0.0427)	(0.0391)	(0.0417)	(0.0399)
Education attainment				
Primary education	0.2070***	0.1834***	0.1602***	0.1601***
	(0.0071)	(0.0076)	(0.0071)	(0.0069)
Lower secondary	0.4107***	0.3759***	0.3367***	0.3512***
	(0.0082)	(0.0085)	(0.0080)	(0.0079)
Upper secondary	0.5452***	0.5058***	0.4659***	0.4730***
	(0.0091)	(0.0095)	(0.0088)	(0.0092)
Secondary vocational	0.6794***	0.6371***	0.5805***	0.5981***
	(0.0109)	(0.0108)	(0.0107)	(0.0116)
Higher vocational	0.8562***	0.8084***	0.7480***	0.7637***
	(0.0108)	(0.0110)	(0.0102)	(0.0103)
Diploma	0.8207***	0.7175***	0.7580***	0.7209***
	(0.0420)	(0.0460)	(0.0347)	(0.0353)
Bachelor's	1.1560***	1.1082***	1.0343***	1.0498***
	(0.0110)	(0.0108)	(0.0103)	(0.0107)
Master's or higher	1.6239***	1.5312***	1.4745***	1.4810***
	(0.0171)	(0.0151)	(0.0144)	(0.0167)
Region of residence				
Bangkok	0.0020	0.0194***	0.0255***	0.0250***
	(0.0057)	(0.0052)	(0.0049)	(0.0054)
North	−0.1419***	−0.1469***	−0.1342***	−0.1173***
	(0.0064)	(0.0060)	(0.0057)	(0.0055)
Northeast	−0.1188***	−0.1030***	−0.1094***	−0.1044***
	(0.0074)	(0.0071)	(0.0068)	(0.0067)
South	0.0057	0.0163***	−0.0213***	−0.0179***
	(0.0056)	(0.0053)	(0.0052)	(0.0054)
Area of residence				
Municipal	0.0834***	0.0855***	0.0977***	0.0854***
	(0.0032)	(0.0031)	(0.0031)	(0.0033)
Log gross provincial product per capita	0.1604***	0.1570***	0.1559***	0.1505***
	(0.0034)	(0.0032)	(0.0034)	(0.0032)
Male	0.1631***	0.1672***	0.1659***	0.1555***
	(0.0040)	(0.0039)	(0.0037)	(0.0039)
Marital status				
Married	0.0535***	0.0604***	0.0734***	0.0777***
	(0.0049)	(0.0044)	(0.0043)	(0.0046)
Divorced, separated, or widowed	−0.0107	−0.0067	−0.0034	−0.0053
	(0.0086)	(0.0077)	(0.0075)	(0.0076)
Work characteristics				
Experience	0.0350***	0.0336***	0.0330***	0.0336***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Experience squared	−0.0004***	−0.0004***	−0.0004***	−0.0004***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Public	0.1500***	0.1354***	0.1592***	0.1298***
	(0.0072)	(0.0071)	(0.0067)	(0.0075)
State enterprise	0.3921***	0.3685***	0.3743***	0.4020***
	(0.0158)	(0.0140)	(0.0147)	(0.0166)
Legislator	0.3547***	0.3828***	0.3896***	0.4115***
	(0.0151)	(0.0150)	(0.0150)	(0.0150)
Professional	0.4674***	0.4945***	0.5012***	0.5018***
	(0.0102)	(0.0094)	(0.0094)	(0.0104)
Technician	0.3686***	0.3544***	0.3454***	0.3461***
	(0.0087)	(0.0077)	(0.0076)	(0.0085)
Clerk	0.2145***	0.2096***	0.2125***	0.2022***
	(0.0076)	(0.0071)	(0.0072)	(0.0074)
Service workers	0.1415***	0.1444***	0.1454***	0.1354***
	(0.0075)	(0.0089)	(0.0071)	(0.0077)
Skilled agricultural	0.1138***	0.1817***	0.0878***	0.1182***
	(0.0125)	(0.0112)	(0.0106)	(0.0116)
Craft	0.0594***	0.0635***	0.0683***	0.0811***
	(0.0065)	(0.0063)	(0.0060)	(0.0062)
Machine operator	0.2254***	0.2220***	0.2115***	0.2078***
	(0.0066)	(0.0061)	(0.0059)	(0.0063)
Mining	0.6015***	0.6067***	0.5466***	0.5099***
	(0.0419)	(0.0327)	(0.0368)	(0.0368)
Utilities	0.4870***	0.3958***	0.4488***	0.3329***
	(0.0304)	(0.0307)	(0.0266)	(0.0280)
Construction	0.3653***	0.3454***	0.3380***	0.2697***
	(0.0105)	(0.0103)	(0.0099)	(0.0098)
Low-skill manufacturing	0.3463***	0.3374***	0.3061***	0.2789***
	(0.0105)	(0.0098)	(0.0097)	(0.0094)
High-skill manufacturing	0.4645***	0.4386***	0.4021***	0.3702***
	(0.0105)	(0.0098)	(0.0098)	(0.0097)
Low-skill services	0.4135***	0.3888***	0.3814***	0.3314***
	(0.0098)	(0.0092)	(0.0091)	(0.0090)
High-skill services	0.3487***	0.3389***	0.3379***	0.2765***
	(0.0103)	(0.0101)	(0.0099)	(0.0099)
Survey quarter				
Quarter 2	0.0136***	−0.0040	−0.0065	0.0099**
	(0.0051)	(0.0049)	(0.0047)	(0.0046)
Quarter 3	0.0146***	0.0196***	0.0243***	0.0365
	(0.0052)	(0.0050)	(0.0047)	(0.0052)
Quarter 4	0.0271***	0.0122***	0.0190***	0.0347
	(0.0053)	(0.0049)	(0.0047)	(0.0046)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.6116	0.6282	0.6332	0.6176

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

Table 10. **Mean Earnings and Direct Cost by Level of Education, 2010**

Education Level	Mean Earnings Cycle (B/year)	Length of School (years)	Annual Direct Cost per Public School Year (B)
No education	51,302.5	n.a.	n.a.
Primary	66,449.5	6	40,970
Secondary (General)	90,258.8	6	29,600
Secondary (Vocational)	122,657.4	3	29,600
		3	40,242
University	224,654.5	4	67,885

B = baht, n.a. = not applicable.

Note: $1 = B35.65 as of 28 August 2015.

Sources: Government of Thailand, National Statistical Office. National Labor Force Survey (Table 2: Number and Percentage of Employed Persons by Industry, 2001–2011). http://service.nso.go.th/nso/nso_center /project/search_center/23project-th.htm (accessed 30 May 2011); National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/699

Table 12. **Shortcut Estimates of the Returns to Education (%)**

Education Level	Private Returns	Social Returns
Primary	4.9	2.7
Secondary (General)	6.0	4.1
Secondary (Vocational)	14.1	8.8
University	37.2	21.3

Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File /DownloadFile/699

Table 13. **Mean Earnings and Direct Cost by Level of Education and Gender**

Education Level	Mean Earnings (B/year)		Length of School Cycle (years)	Annual Direct Cost per Public School Year (B)
	Male	Female		
No education	56,338.8	46,840.7	n.a.	n.a.
Primary	71,254.0	59,399.4	6	40,970
Secondary (General)	97,279.9	80,897.9	6	29,600
Secondary (Vocational)	132,224.3	108,986.7	6	40,242
University	247,880.8	210,802.3	4	67,885

B = baht, n.a. = not applicable.

Note: $1 = B35.65 as of 28 August 2015.

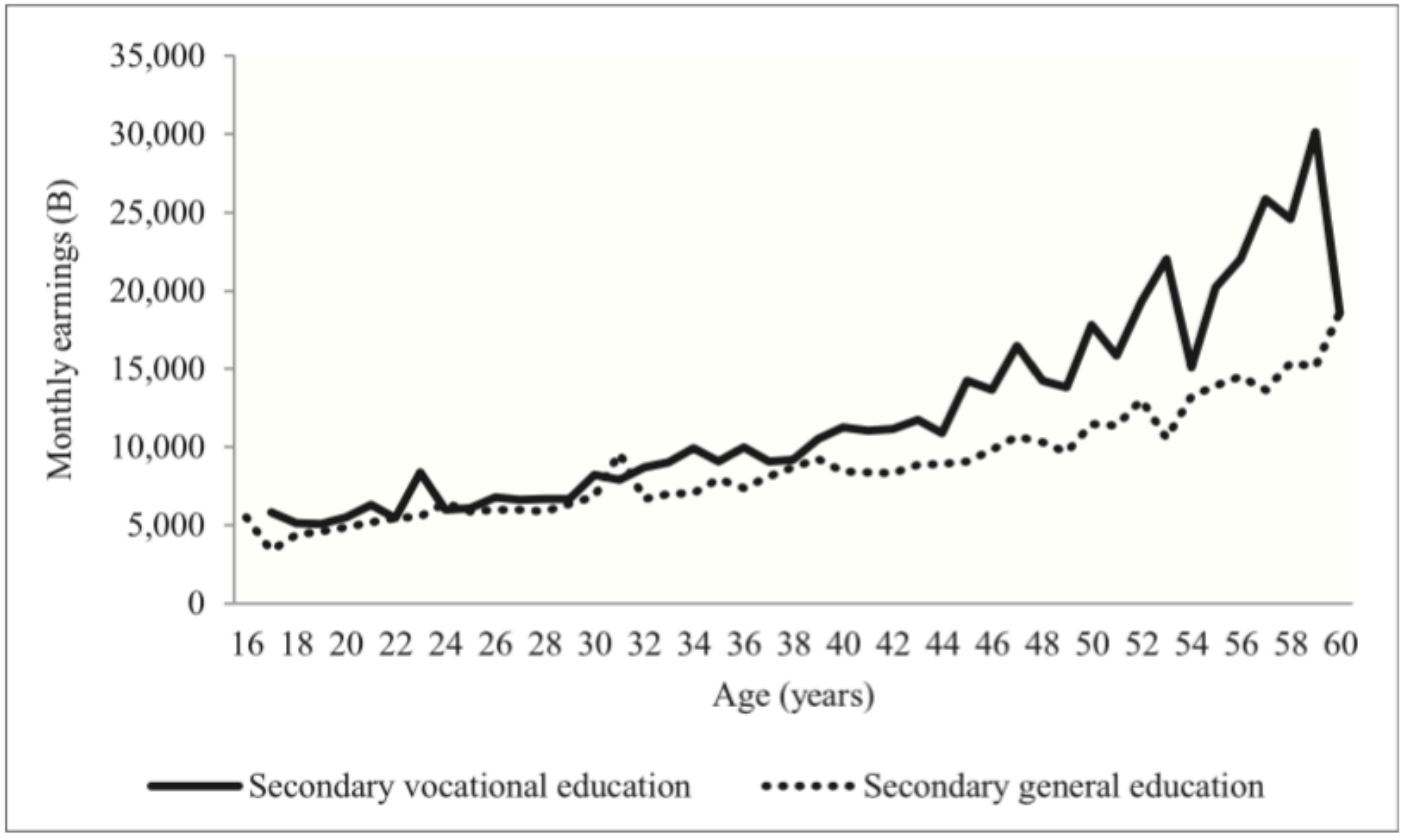
Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/

Table 14. **Shortcut Estimates of the Returns to Education by Gender (%)**

	Private Returns		Social Returns	
Education Level	**Male**	**Female**	**Male**	**Female**
Primary	4.41%	4.47%	2.55%	2.38%
Secondary (General)	6.09%	6.03%	4.30%	4.03%
Secondary (Vocational)	14.26%	13.91%	9.11%	8.29%
University	38.70%	40.14%	22.80%	21.83%

Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/699

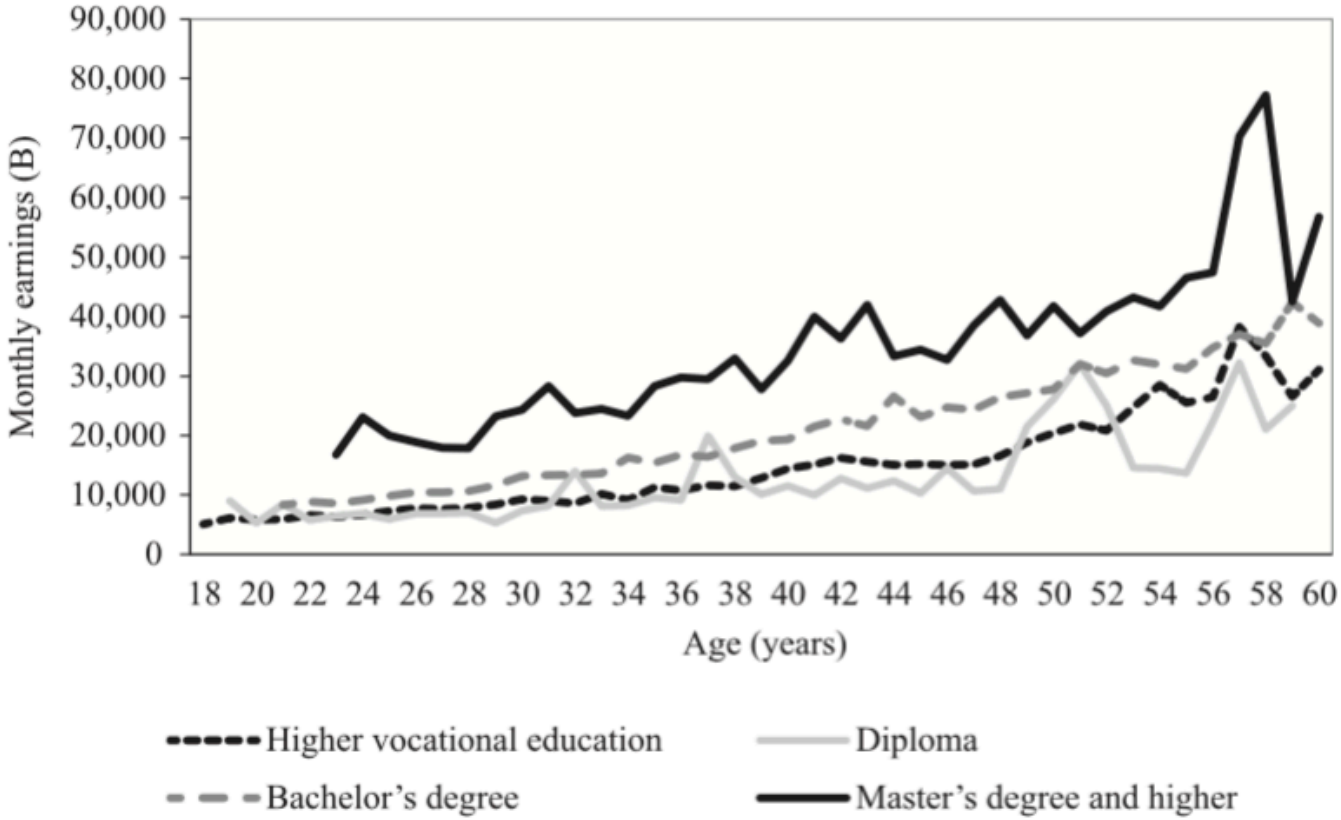
Figure 3. **Average Monthly Earnings for Secondary Vocational Education Attainment and Secondary General Education Attainment**



B = baht.

Source: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm

Figure 4. **Average Monthly Earnings for Higher Vocational Education Attainment, Bachelor's Degree Attainment, and Master's Degree or Higher Attainment**



B = baht.

Source: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm

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