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Abstract

The purpose of this article is to investigate to what extent education explains the transmission of economic status from parents to offspring in the cases of Japan and South Korea. The intergenerational transmission through education is measured by decomposing the return on an offspring's education and the linkage between parental earnings and an offspring's education. The estimation results suggest that education accounts for the order of 0.1, or 40-50% of the intergenerational transmission in terms of earnings.
JEL classification: D31, J62

I. Introduction

Following the seminal work of Solon (1992) and Zimmerman (1992), an increasing number of studies have investigated intergenerational economic mobility by estimating the elasticity of an offspring's earnings with respect to parents' earnings (reviewed by Solon, 2002). Recently, international studies also have researched East Asian countries such as Singapore (Ng, 2007; Ng *et al*., 2009), Japan (Ueda, 2009), South Korea (Ueda, 2013), and China (Gong *et al*., 2012). These studies suggest that intergenerational economic persistence in East Asia is comparable to that of Western countries.

As a channel of the intergenerational transmission, education is noted as an important device. Johnson (2002) finds that links in education are somewhat stronger than links in income. Studies on transmission accounting suggest that education explains approximately 0.1 in terms of the elasticity or 30-50% of the transmission cases in the USA and the UK (Bowles and Gintis, 2002; Restuccia and Urrutia, 2004; Blanden *et al*., 2007).

This article aims to measure to what extent education accounts for intergenerational earnings transmission, using household microdata from Japan and South Korea (Korea, henceforth). Transmission through education is measured by decomposing the return on an offspring's education and the linkage between parental earnings and an offspring's education. The results suggest that education accounts for the order of 0.1 or 40-50% of the transmission cases Japan and Korea.

II. Empirical Analysis Framework

Basic framework to estimate intergenerational elasticity

The analysis follows the two-sample, two-stage approach proposed by Björklund and

Jäntti (1997). Let y_{0i} denote the lifetime log earnings of the parent and y_{1i} denote the earnings of the offspring in family i. The intergenerational relationship is expressed as

$$y_{1i} \quad a_0 \quad y_{0i} \quad _i \tag{1}$$

where a_0 is a constant, $_i$ is the error term, and $$ represents the elasticity of the offspring's lifetime earnings with respect to the parents' lifetime earnings. Let the short-run log earnings of the offspring be denoted as y_{1it} for family i at time t as a substitute of lifetime earnings that are rarely observed by statisticians. The short-run log earnings of the offspring are expressed as

$$y_{1it} \quad y_{1i} \quad a_1 A_{1it} \quad a_2 A_{1it} \quad ^2 \quad u_{1it} \tag{2}$$

where A_{1it} is the age of the offspring i at time t, a_1 and a_2 are coefficients, and u_{1it} is the error term.

Because parental earnings are also rarely observed, these earnings are predicted from characteristics such as education and occupation. Assume that the lifetime earnings of the parents (y_{0i}) are explained by a vector of parental characteristics of q_{0i} associated with a coefficient vector of $$. At the first stage, $$ is estimated using wage surveys that include earnings, age, education, and occupation. The parental earnings of y_{0i} are then predicted by q_{0i} ˆ , where ˆ is an estimate of $_1$. At the second stage, by substituting Equation (2) into Equation (1) the elasticity is estimated by

$$y_{1it} \quad a_0 \quad y_{0i} \quad a_1 A_{1it} \quad a_2 A_{1it} \quad ^2 \quad (_i \quad u_{1it}) \tag{3}$$

using predicted y_{0i}.

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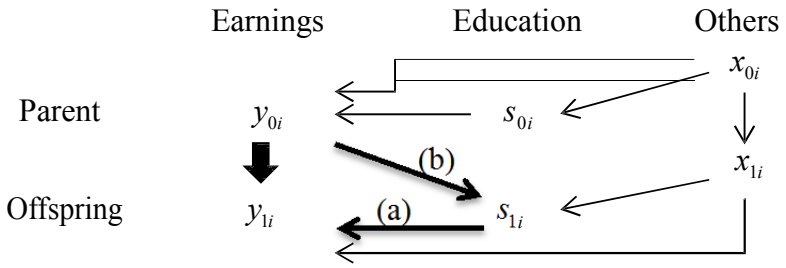
[1] The estimation method for the prediction follows Ueda (2009, 2013).

Intergenerational transmission through education

Suppose that earnings reflect the school education of s_{ni} and the other factors (such as innate ability or social background) of x_{ni} for n={0 (parent), 1 (offspring)}. Fig. 1 illustrates possible transmission channels. In addition to education, other factors might directly affect earnings and might be inherited. The transmission through education is decomposed into the following: (a) the return on the offspring's education, and (b) the linkage from the parental earnings to the offspring's education.

Figure 1: Possible transmission channels



With regard to education, consider a set of dummy variables of $\{g_{1i}, g_{2i},..., g_{Ki}\}$ for the educational levels of $\{1,...,K\}$ with a referenced level. Regarding channel (a), a conventional wage equation is estimated by

$$y_{1it} \quad _0 \; a_1 A_{1it} \; a_2 A_{1it}^{\;2} \; \{ \; _1 g_{1i} \quad _2 g_{2i} \quad \cdots \quad _K g_{Ki} \} \; v_{1it} \tag{4}$$

where $\{ \; _1, \; _2,..., \; _K \}$ is a set of the return on education and v_{1it} is the error term. The intergenerational elasticity through (a) and (b) is measured by

$$_g \quad dy_{1it} / dy_{0i} \quad _{k\;1}^{K} (dy_{1it} / dg_{ki})(dg_{ki} / dy_{0i})$$

$$_{k\;1}^{K} \; _k (dg_{ki} / dy_{0i})$$

Equation (4) is estimated using ordinary least squares (OLS) by adding parental education to reduce possible upward bias on the return on education.[2] Regarding channel (b), expected (g_{ki} / y_{0i}) may be estimated as a marginal effect at the mean using the ordered probit model for the choice of $\{g_{1i}, g_{2i}, ..., g_{Ki}\}$.

III. Data

The data for Japan are obtained from the 1993-2006 rounds of the *Japanese Panel Survey of Consumers* (JPSC). The JPSC includes 2836 women from 24-47 years old and their families; therefore, men's observations are limited to married participants. Short-run earnings are derived from the annual earnings of the previous year in the latest round available for each observation.

The data for Korea are obtained from the 1998 round of the *Korean Labor & Income Panel Study* (KLIPS). The survey includes 5000 urban households and 13 321 family members ages 15 and older. Short-run earnings are represented by monthly earnings. The final selected sample includes sons from 30-44 years old.

Both the JPSC and the KLIPS provide parental information. However, parental earnings are represented by a father's earnings because of a data limitation with regard to mothers. To reduce possible bias in estimating channels (a) and (b), the educational years of the father and the mother are added in the explanatory variables for Japan whereas the educational years of the father are added for Korea.

In Japan and Korea, numerous women withdraw from full-time work because of

[2] Card (1999) explains that education may be correlated to unobserved ability because educational return might vary across individuals and because those with higher returns may choose better education. Card suggests, based on relevant studies, that the upper bias of OLS estimation using cross-section data may be approximately 10% or less and that the upper bias can be reduced by adding family characteristics such as parental education that partially substitutes for the unobserved ability of the offspring.

marriage or childbirth; in such cases, family incomes may be considered to represent a daughter's economic status. However, for the purpose of measuring educational effect, an offspring's own earnings are considered in this article. Because of this limitation, the daughter sample is not analyzed for Korea; however, the daughter sample with full-time earnings is analyzed for Japan, noting the fact that the observed ages are relatively young.

Table 1 reports summary statistics. The average age of sons in the study is 37 (39) for Japan (Korea), whereas the average age of daughters for Japan is 31. The average number of years of an offspring's education is approximately 13 years for both countries. The average education is near the senior-high-school level for fathers in Japan, and near the junior-high-school level for fathers in Korea.

IV. Results

Table 2 reports the estimation results of (a) the return on an offspring's education and (b) the ordered probit estimation of an offspring's education. In addition, the marginal effects, the calculated effect from (a) and (b) at each educational level, and $_g$ as the transmission through education[3] are included.

The transmission through education is estimated as 0.170 (44%) for married sons and 0.114 (51%) for daughters in Japan, and 0.140 (47%) for Korea. The majority of the transmission is explained by university education in both countries. The results from Japan and Korea are similar to previous studies from the USA and the UK, suggesting that education accounts for approximately 0.1 or one-third to one-half of transmission.

[3] An effect of unofficial vocational school is also considered for daughters in Japan because of its positive and significant effect on earnings. SEs are corrected following Murphy and Topel (1985) when predicted parental earnings are applied.

V. Conclusion

The decomposition results suggest that education accounts for the order of 0.1, or 40-50%, of the intergenerational transmission in the cases of Japan and Korea. The results are similar to previous results from the USA and the UK. Notably, the private sector finances approximately 30% or more of educational expenses for all 4 countries. Recent studies focus on the relationship between mobility and public expenditures on education (e.g., Mayer and Lopoo, 2008). Further research might be required with regard to a different type of society such as Scandinavian countries, in which the private sector finances only 3% of education.[4]

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[4] Source: World Databank (http://databank.worldbank.org/ddp/home.do) (World Bank). Figures are in 2008.

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Table 1: Sample characteristics

	Japan		Japan		Korea	
	Married sons		Daughters		Sons	
Age	36.8	(4.3)	30.8	(6.0)	39.3	(8.0)
Age range	30-44		23-46		25-54	
Earnings	6.205	(0.481)	5.530	(0.556)	194.3	(174.4)
Educational years	12.9	(1.7)	13.6	(1.7)	13.3	(2.7)
Junior high school or less	8.9%		2.2%		10.5%	
Senior high school	50.8%		51.2%		42.3%	
Unofficial vocational school	13.2%		22.3%			
Junior college	4.2%		23.8%		15.5%	
University and higher	36.2%		22.8%		31.6%	
Father's educational years	11.5	(2.4)	12.1	(2.5)	8.8	(3.5)
Correlation of educational years	0.362		0.389		0.358	
Sample size	744		1204		2446	

Notes: The numbers in parentheses are SDs. Earnings are in million yen for Japan and ten thousand won for Korea.

Table 2: Transmission through education

	Japan		Japan		Korea	
	Married sons		Daughters		Sons	
(a) The OLS estimation of return on education ($_k$)						
Junior high school (D)	-0.130	(0.059)	-0.434	(0.105)	-0.308	(0.055)
Unofficial vocational school (D)			0.095	(0.040)		
Junior college (D)	0.004	(0.082)	0.151	(0.041)	0.160	(0.041)
University (D)	0.314	(0.038)	0.326	(0.045)	0.267	(0.032)
Adj. R^2	0.171		0.084		0.138	
(b) Ordered probit for education choice						
Predicted parental earnings	1.276	(0.331)	0.955	(0.190)	1.029	(0.185)
Threshold 1	1.764	(0.051)	1.740	(0.049)	1.564	(0.035)
Threshold 2	1.891	(0.051)	2.303	(0.048)	1.993	(0.036)
Threshold 3			3.064	(0.093)		
McFadden Pseudo R^2	0.074		0.074		0.066	
Marginal effect (g_k / y_0)						
Junior high school	-0.163	[0.021]	-0.032	[0.014]	-0.110	[0.034]
Senior high school	-0.330		-0.307		-0.300	
Unofficial vocational school			-0.040	[-0.004]		
Junior college	0.020	[0.000]	0.113	[0.017]	0.027	[0.004]
University	0.473	[0.149]	0.267	[0.087]	0.383	[0.102]
Transmission through education	0.170		0.114		0.140	
Elasticity by equation (3)	0.388	(0.067)	0.225	(0.053)	0.302	(0.052)
(% of education)	43.8%		50.9%		46.5%	
Sample size	744		1204		1397	

Notes：Education levels are referenced to senior high school. The constant and parental education for (a) and (b), and age and age squared for (a) are also used. (D) indicates a dummy variable. The numbers in parentheses are SEs. The numbers in brackets are [$_k$ (g_k / y_0)] at each education. "Transmission through education" is the sum of the numbers in brackets.