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Does Human Capital Investment Increase Inequality of Earnings in Korea?*

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The empirical human capital model of personal distribution of earnings hypothesizes that there is positive relationship between human capital investment and inequality of earnings. Some empirical evidence supports this hypothesis, but some does not. Thus, the effect of investment in human capital on inequality of earnings remains controversial.

By using the same human capital framework, I find that human capital investment per se does not ensure a more equal or a more unequal distribution of earnings, and it can be used as a tool to solve not only absolute poverty but also inequality of earnings by implementing relevant policy measures.

I. Introduction

With the advent of the human capital theory in the 1960s, the role of investment in human capital in reducing inequality of earnings distribution has attracted considerable attention. The human capital theory predicts a positive relationship between investment in human capital and earnings inequality even though investment in human capital improves the level of earnings.[1] However, some economists such as Tinbergen (1972) and Winegarden (1979) have advocated investment in human capital as a major set of policies directed toward the important goal of improving the level of earnings and of reducing inequality of earnings. Therefore, the effects of investment in human capital on the personal distribution of earnings still remain controversial.

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1 See Chiswick (1974), Hirsch (1978), Shah (1986), etc.

II. The Human Capital Model

Human capital is defined as any productive power embodied in a person produced at a cost and providing useful services over a lifetime in either production or consumption (Chiswick (1974)). Human capital is acquired by formal education or schooling, vocational training, on-the-job training, learning by doing through job market experience, medical care, getting information, migration, and so on. However, it is impossible to deal with all kinds of human capital because we cannot get information on kinds of human capital accumulated by each individual. Therefore, I will consider only two forms of human capital in this paper: education and job market experience. Job market experience is considered as post-school investment in human capital.

People with the same level of human capital actually have different experience-earnings profiles, because of differences in abilities, attitudes toward work, family and cultural backgrounds, and so on. Therefore, the personal distribution of earnings can be measured as a distribution of experience-earnings profiles, that is, as the variance of the natural logarithm of earnings of each individual.

In the human capital theory, it is assumed that investment in human leads to higher productivity of workers, which causes higher earnings. The relationship between the level of earnings and the level of human capital investment is generally represented as following Mincer's earnings function (Mincer (1974)).

$$(3)\quad \ln Y = a + r\,ED + b_1 EXP + b_2 EXPSQ + u$$

or

$$(4)\quad \ln Y = a + r\,ED + b_1 EXP + b_2 EXPSQ + c \ln WEEK + u$$

where $\ln Y$ = natural logarithm of earnings,
ED = years of education,
EXP = years of job market experience,
$EXPSQ = (EXP)^2$,
$\ln WEEK$ = natural logarithm of the number of weeks worked,
u = stochastic error term.

Since earnings increase with educational level, the coefficient of years of education(r) is positive and it is interpreted as an estimate of the average rate of return to education (Conlisk (1987)). Years of job market

uncorrelated, and if we permit interdependency only among ED, EXP, and EXPSQ, then taking the variance of both sides of equation (3) would result in:

$$
\begin{aligned}
(7)\ \text{Var}(\ln Y) &= (\bar{r})^2\ \text{Var}(ED) + \text{Var}(r)\ (\overline{ED})^2 + \text{Var}(r)\text{Var}(ED) \\
&+ (\bar{b}_1)^2\ \text{Var}(EXP) + \text{Var}(b_1)(\overline{EXP})^2 + \text{Var}(b_1)\text{Var}(EXP) \\
&+ (\bar{b}_2)^2\ \text{Var}(EXPSQ) + \text{Var}(b_2)(\overline{EXPSQ})^2 \\
&+ \text{Var}(b_2)\text{Var}(EXPSQ) + 2\bar{r}\bar{b}_1\ \text{Cov}(ED, EXP) \\
&+ 2\bar{r}\bar{b}_2\text{Cov}(ED, EXPSQ) + 2\bar{b}_1\bar{b}_2\text{Cov}(EXP, EXPSQ) \\
&+ \text{Var}(u)
\end{aligned}
$$

In equation (7), most of terms are readily obtainable from the available data. The only unknowns are Var(r), Var(b_1), and Var(b_2). However, if the underlying model is equation (7), then the equation to be estimated is:

$$
\begin{aligned}
(8)\ \text{Var}(\ln Y) &= e_0 + e_1((\bar{r})^2\ \text{Var}(ED)) + e_2(\overline{ED})^2 + e_3\text{Var}(ED) \\
&+ e_4((\bar{b}_1)^2\ \text{Var}(EXP)) + e_5(\overline{EXP})^2 + e_6\ \text{Var}(EXP) \\
&+ e_7((\bar{b}_2)^2\ \text{Var}(EXPSQ)) + e_8(\overline{EXPSQ})^2 \\
&+ e_9\ \text{Var}(EXPSQ) + e_{10}(2\bar{r}\bar{b}_1\text{Cov}(ED, EXP)) \\
&+ e_{11}(2\bar{r}\bar{b}_2\ \text{Cov}(ED, EXPSQ)) \\
&+ e_{12}(2\bar{b}_1\bar{b}_2\ \text{Cov}(EXP, EXPSQ)) + u'
\end{aligned}
$$

where Var(u) is captured in e_0, and u′ is a random disturbance term. The value of unknowns is roughly measured by estimated coefficients, that is, $\text{Var}(r) = e_2 = e_3$, $\text{Var}(b_1) = e_5 = e_6$, and $\text{Var}(b_2) = e_8 = e_9$.

III. Data

The data for this study are raw data of the Occupational Wage Survey of Korea for the years 1976 and 1986 conducted by the Ministry of Labor of the Republic of Korea. The purpose of this survey is to provide basic wage statistics for the study of labor earnings and wage structure in the Korean labor market. The survey collects various information on workers, such as age, sex, level of education, occupation, industry, skill level, years of experience in the current occupation, years of employment in the current firm, number of days worked in a month, number of hours worked in a month, regular monthly payment, overtime payment, other sources of payment, bonus in a year, total monthly payment, location of the firm,

IV. Estimation and Empirical Results

A. The Unit of Analysis

Usually workers in the same occupation group are relatively homogenous with respect to the amount of human capital accumulated. As a result, if occupation is selected as the unit of observation, human capital variables may have relatively weak explanatory power. This seems to be the reason why Shah (1986) finds that education has no significant effect on the distribution of earnings when occupation is selected as the unit of observation, while education has a significant effect on the distribution of earnings when region is chosen as the unit of observation. Region may be thought of as an appropriate unit of observation in Korea, but since Korea is a small country and most firms are concentrated in certain regions, if we choose region as the unit of observation, we have too small a number of firms in many regions. So region seems to be inappropriate as the unit of observation in Korea. Usually the variance of human capital by industry group will be relatively large. Therefore, industry seems to be the most appropriate unit of analysis. So I use industry as the unit of observation in this study.

B. The Determinants of the Personal Distribution of Earnings

The regression results are presented in Table 1, and a detailed explanation on the personal distribution of earnings follows.

1. The Rate of Return to Education and the Variance of Education

For both years, the product of the rate of return to education and the variance of education $((r)^2\text{Var}(ED))$ has a significant positive sign, and this is consistent with the findings of Hirsch (1978) and Shah (1986). This result means that there is a positive relationship between inequality of earnings and $(\bar{r})^2\text{Var}(ED)$. Therefore, we can draw two policy implications from this result, which Hirsch (1978) and Shah (1986) neglected.

First, if the rate of return to education is stable, as the variance of education becomes smaller, earnings inequality will decrease. Thus, policies that would help to equalize educational opportunities would reduce inequality of earnings distribution in the future by reducing the variance of education.

When the average level of education of the labor force is zero, the variance of education will also be zero. As some people begin to go to primary schools, middle schools, high schools and colleges, however, the

Thus, even if investment in education can, in some circumstances, lead to a greater inequality of the personal distribution of earnings in the short run, policies designed to reduce inequality of educational opportunities are likely to contribute to a more equal distribution of earnings in the long run. Examples of such policies include subsidies for educational expenditures, exemption of a part of educational expenditures for students in the households of low income level, bank loans for educational expenditures at more favorable conditions, tax reduction on educational expenditures, an increase in the compulsory education period, providing more evening school education and correspondence education, and an increase in the vocational training opportunity.

Second, if the variance of education is stable, as the average rate of return to education decreases, earnings inequality will become small. Therefore, policies that would reduce the wage differential by educational level will reduce inequality of earnings by reducing the average rate of return to education.

However, the regression results show that the effect of the variance of education on inequality of earnings is not significant in either year. This is consistent with the regression result of Hirsch (1978) and Shah (1986). According to this result, the variance of education per se is not important in determining inequality of earnings, even if the interaction effect between the rate of return to education and the variance of education has a significant positive effect on inequality of earnings.

2. *The Level of Education*

The coefficient of $(\overline{ED})^2$ is insignificant in both years. Therefore, as in Hirsch (1978) and Shah (1986) the level of education per se has no significant effect on inequality of earnings. Thus, an increase in the average level of education itself does not guarantee the decrease of inequality of earnings.

3. *The Level of Experience and the Variance of Experience*

The coefficients of $(\overline{EXP})^2$ and $(\overline{EXPSQ})^2$ are insignificant in both years, and this is consistent with the findings of Hirsch (1978) and Shah (1986). This result means that the years of experience per se is not important in determining the distribution of earnings.

The products of the slope coefficient of the earnings profile and the variance of experience (more precisely $(\bar{b}_1)^2$Var(EXP) and $(\bar{b}_2)^2$ Var(EXPSQ)) are insignificant in 1976 as in Hirsch (1978) and Shah (1986), but they are significant in 1986. Also the coefficient of Var(EXP)

variance of education will reduce inequality of earnings in the future.

It is found that the relationship between the variance of education and the level of education depicts an inverted U-shaped curve. Thus, if other things remain constant, it can be hypothesized that, when the average level of education is very low, investment in education will initially increase inequality of earnings in the short run, but its effects on inequality of earnings gradually decline, and investment in education will reduce inequality of earnings in the long run.

From these regression results, we can see that the absolute amount of human capital investment is not important in the personal distribution of earnings. Investment in human capital itself will not ensure a more equal or a more unequal distribution of earnings, and it could be used as one of the tools for equalizing the distribution of earnings if the government implements appropriate policy measures.

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