CAES Working Paper Series

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WP-2018-005

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Indirect Policies for Poverty Alleviation through Education Systems in Developing Countries*

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11/07/2018

Abstract

In developing countries, poverty alleviation is a high priority task and many direct policies for poverty reduction are analyzed and implemented. However, little attention has been given to the mechanisms of policies whose main purposes apparently not poverty reduction but are nonetheless effective at alleviating poverty. This study focuses on two policies-a program for improving learning environments and a hiring policy for skilled jobs, which are not designed directly for poverty reduction. Then we show that governments have more policy design choices for poverty alleviation by clarifying the possibility and mechanisms by which the policies contribute to decreasing poverty.

Key words: Education system, Poverty alleviation, Hiring policy, Learning environment
JEL Classification Codes: D3, I2, I3,

*I wish to thank Naoya Hiraishi and Kosuke Mizuno for valuable comments. This work was supported by JSPS KAKENHI Grant Number 18K12782.
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1 Introduction

Governments have implemented policies in finite budgets by considering the order of priority and social welfare maximization. In developing countries, poverty alleviation is one of the most important challenges and a higher priority task than in developed countries, in line with the Millennium Development Goals and the 2030 Agenda for Sustainable Development. Therefore, many direct policies for poverty alleviation have been designed and adopted. Governments could have more policy design choices for poverty reduction if it becomes clear that several policies whose main goals are not poverty alleviation can contribute to poverty reduction.

In this study, we focus on two policies: a program for improving learning environments, such as transferring school supplies or decreasing child labor, and a hiring policy for skilled jobs in the private sector. The main purposes of these policies are apparently not poverty alleviation. We propose that such policies come to have higher priority for governments in developing countries by clarifying the possibility and mechanisms of poverty reduction. In particular, we first, show that supporting learning environments can alleviate poverty in two ways: increasing the productivity of the poor or increasing the quality of education for the poor. Second, we show when a hiring policy for skilled jobs increases the quality of education for the poor and contributes to poverty reduction.

Numerous attempts have been made by scholars to show the effects and issues of poverty alleviation programs that increase the incomes of the poor in developing countries. These policies are divided into two types. One includes policies that increase the incomes of the poor directly, such as cash transfers. In particular, the inefficiency of simple cash transfer systems has been controversial. Besley and Coate (1992) clarify that a workfare system is one solution to the problem. Moreover, Nichols and Zeckhauser (1982), Dye and Antle (1986), and Blackorby and Donaldson (1988) point out that in-kind transfers can overcome the problem. Nakamura (2007) shows that efficient poverty alleviation programs are realized by providing quasi-public goods.

The other type includes policies that can increase individual productivity and contribute to raising the incomes of the poor, such as education programs. A large body of literature also theoretically and empirically analyzes the rate of return and redistribution effects. Glomm and Ravikumar (1992), Oshio (2007), and Gutierrez and Tanaka (2009) show that inequality is caused

by several education systems. Recently, Aslam et al. (2012), Wannakrairoj (2013), Curi and Menexes-Filho (2014), and Enu et al. (2014) clarify that there is a positive correlation between education and individuals' wages in some developing countries.

However, little attention has been given to the possibility and mechanisms of policies whose main purposes are not poverty reduction but affect poverty alleviation through education systems. Therefore, we are concerned with the mechanisms and we propose more policy design choices in developing countries.

The remainder of the paper is organized as follows. In the following section, we examine a model of education and individuals' incomes and point out that several factors can increase the quality of education for the poor. Then in Section 3, we focus on two economic policies -a program of improving learning environments and a hiring policy for skilled jobs in the private sector- and we clarify the mechanism of poverty alleviation caused by the policies. The final section concludes.

2 The model

We present a simple model based on Oshio (2007). The government provides two types of education, basic and advanced, during the individuals' compulsory education period. The contents of basic education, that is, numeracy and literacy, are included in the contents of advanced education. Individuals choose their appropriate education from two types of education for themselves by considering their learning ability and learning environments.

Individuals are divided into two types according to their learning ability based on their potential understanding and learning environments: L and H. L individuals have low productivity, because they choose to receive basic education only and have low skills, whereas H individuals show high productivity when they engage in skilled jobs, because they receive advanced education and have high skills.

There are two possible reasons that L individuals choose to receive basic education. First, they may have an aversion to study because their potential understanding is not high and they choose easier education. Second, they do not have good learning environments, that is, they cannot concentrate on lectures because they have to work for a living or they are malnourished.[1]

[1] Coleman et al. (1966) shows that the rate of return from education is related to

Since L individuals do not receive advanced education, they cannot obtain high skills. Therefore, they engage in unskilled jobs showing low productivity.

On the other hand, H individuals have both an aptitude for study and good learning environments. Therefore, they choose to receive advanced education and high skills. They can show high productivity when they engage in skilled jobs in the private sector, whereas they show low productivity when they cannot find skilled jobs because of frictional unemployment and have to engage in unskilled jobs that need only low skills.[2] In this case, H individuals show low productivity regardless of receiving advanced education.

We assume that the proportions of L and H individuals in a country are p and $1-p$, respectively. Then, $0 < p < 1$ is satisfied. q is the probability that H individuals can obtain skilled jobs in the private sector and $0 < q < 1$ is satisfied.

The utility function of individual i is written as follows:

$$U_i = (1-t)a_i(\bar{E}_i)L_i - \frac{L_i^{1+\nu}}{1+\nu}, \tag{1}$$

where t, a_i, and E_i are defined as the income tax rate for educational expenditure, learning ability of individual i, and the type of education received by individual i, respectively. We assume that there are the same hours of education for the two types of education, because a period of compulsory education is decided, whereas the quality of education is different. When high-quality education is provided, teachers are well trained and facility investments, such as air conditioners and black boards in a classroom, are exhaustively complete. Therefore, $a_i(\bar{E}_i)$ is the function of individual productivity when individuals receive education $\bar{E}_i$. $a_i(\bar{E}_i)L_i$ indicates individual incomes, where L_i implies the labor supply of individual i. Then, we assume that individuals whose incomes are shown by $a_L(\bar{E}_L)L_L$ are the poor.

The function of individual productivity is written as[3]

$$a_i(\bar{E}_i) = a_i E_i^{\alpha},\ 0 < a_L < a_H,\ 0 < \alpha < 1. \tag{2}$$

individuals' own background.

[2] In this study, we do not consider structural unemployment, because we assume identical individuals except their learning ability. Moreover, we do not assume unemployment by lack of demand because wages are decided by individuals' productivity and labor supply, and there are no minimum wages.

[3] This kind of productivity function is defined in Ulph (1977).

Individuals maximize their utility according to (1) by adjusting their labor supply L_i. The first order condition of (1) for L_i is

$$\frac{\partial U_i}{\partial L_i} = (1-t)a_i E_i^{\alpha} - L_i^{\nu} = 0. \tag{3}$$

From (3), we obtain

$$L_L = ((1-t)a_L E_L^{\alpha})^{\frac{1}{\nu}}, \tag{4}$$

$$L_H = ((1-t)a_H E_H^{\alpha})^{\frac{1}{\nu}}, \tag{5}$$

and

$$L'_H = ((1-t)a_H E_L^{\alpha})^{\frac{1}{\nu}}. \tag{6}$$

(5) indicates the labor supply when H individuals engage in skilled jobs in the private sector. On the other hand, (6) implies the labor supply when H individuals fail to find skilled jobs and engage in unskilled jobs in the private sector.

Next, we consider how to decide the income tax rate given by the labor supply shown in (4), (5), and (6). The tax rate is decided as

$$p\bar{E}_L + (1-p)\bar{E}_H = t(pa_L E_L^{\alpha} L_L + (1-p)qa_H E_H^{\alpha} L_H + (1-p)(1-q)a_H E_L^{\alpha} L'_H). \tag{7}$$

Finally, the relationship between the two types of education is written as

$$\bar{E}_H = \lambda \bar{E}_L. \tag{8}$$

The government spends on both types of education based on their quality. From (8), we find that the government spends more on basic education than on advanced education when $\lambda < 1$, while it spends more on advanced education than on basic education when $\lambda > 1$. The government provides the same quality of education to L and H when $\lambda = 1$.

Let us introduce individual utility, U_L and U_H. From (4), (5), (6), (7), and (8), we obtain

$$E_L^{\frac{\nu-\alpha(1+\nu)}{\nu}} = \frac{t(1-t)^{\frac{1}{\nu}}}{p+(1-p)\lambda}(pa_L^{\frac{1+\nu}{\nu}} + (1-p)(q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q))a_H^{\frac{1+\nu}{\nu}}). \tag{9}$$

By substituting (2), (4), (5), (6), (8), and (9) into (1), we introduce the value of U_L and U_H as follows:

$$\begin{aligned} U_L &= \frac{\nu}{1+\nu} a_L^{\frac{1+\nu}{\nu}} (t^\alpha (1-t)^{1-\alpha})^{\frac{1+\nu}{\nu-\alpha(1+\nu)}} \\ &\quad (\frac{p a_L^{\frac{1+\nu}{\nu}} + (1-p)(q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q) a_H^{\frac{1+\nu}{\nu}}}{p + (1-p)\lambda})^{\frac{\alpha(1+\nu)}{\nu-\alpha(1+\nu)}}, \end{aligned} \tag{10}$$

and

$$\begin{aligned} U_H &= \frac{\nu}{1+\nu} a_H^{\frac{1+\nu}{\nu}} (t^\alpha (1-t)^{1-\alpha})^{\frac{1+\nu}{\nu-\alpha(1+\nu)}} (q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q) \\ &\quad (\frac{p a_L^{\frac{1+\nu}{\nu}} + (1-p)(q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q) a_H^{\frac{1+\nu}{\nu}}}{p + (1-p)\lambda})^{\frac{\alpha(1+\nu)}{\nu-\alpha(1+\nu)}}, \end{aligned} \tag{11}$$

(see Appendix A).

The government decides the income tax rate as $t = \alpha$ by maximizing individual utility (10) and (11).[4] Then, we introduce the social welfare function of Bentham.[5]

$$\begin{aligned} W &= pU_L + (1-p)U_H \\ &= \frac{\nu}{1+\nu} (\alpha^\alpha (1-\alpha)^{1-\alpha})^{\frac{1+\nu}{\nu-\alpha(1+\nu)}} \\ &\quad \frac{(p a_L^{\frac{1+\nu}{\nu}} + (1-p)(q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q) a_H^{\frac{1+\nu}{\nu}})^{\frac{\nu}{\nu-\alpha(1+\nu)}}}{(p + (1-p)\lambda)^{\frac{\alpha(1+\nu)}{\nu-\alpha(1+\nu)}}}. \end{aligned} \tag{12}$$

The value of λ that maximizes (12) is written as

$$\lambda = (\frac{p q a_H^{\frac{1+\nu}{\nu}}}{p a_L^{\frac{1+\nu}{\nu}} + (1-p)(1-q) a_H^{\frac{1+\nu}{\nu}}})^{\frac{\nu}{\nu-\alpha(1+\nu)}}, \tag{13}$$

(see Appendix B).

From this examination, we obtain two propositions.

[4] We differentiate (10) and (11) partially with respect to t. Then, we obtain $t = \alpha$.

[5] As Oshio (2010) describes, many works assume that one of the important goals of education policies is to maximize the social welfare proposed by Bentham.

Proposition 1 *The higher the probability of getting skilled jobs in the private sector is, the more a government spends on advanced education.*

Proof. It is observed that (13) is an increasing function of q. Therefore, a government tends to increase fiscal spending on advanced education when H individuals can easily obtain skilled jobs. ■

In addition, it is found that the upper limit of expenditure for advanced education is realized when all H individuals can engage in skilled jobs, that is, $q = 1$.

Proposition 2 *A government increases the quality of basic education when the number of individuals whose learning ability is low decreases, whereas the government increases the quality of advanced education when the number of individuals whose learning ability is high decreases.*

Proof. It is observed that (13) is an increasing function of p. Therefore, the more H individuals exist, the more a government spends on basic education and vice versa. ■

3 Indirect policies for poverty alleviation

In this section, we consider the possibility and mechanisms of poverty alleviation by the following two policies focused on the education system. First, we examine the effect of a policy that supports individual learning environments. Examples of such policies include provision of school supplies to poor families, decrease of child labor, and supports of malnourished children by cash transfers. Then, we obtain the following propositions.

Proposition 3 *A policy for supporting individual learning environments can alleviate poverty by increasing the productivity of the poor or increasing the quality of education of the poor.*

Proof. First, we show the direct effect of the policy. Some L individuals change into H individuals only by improving the learning environment. For example, children whose learning environments were not good can receive advanced education through the elimination of child labor or nutritional deficiency. Then, these policies themselves represent a departure from poverty.

Second, we consider the indirect effect of the policy. The ratio of the fiscal spending relationship between the two types of education λ decreases. This outcome is because p decreases, since some L individuals change into H individuals, as we see in Proposition 2. The change urges the government to increase the quality of basic education.

Whether quality education actually increases or not depends on the change of the total amount of tax revenue for education and the ratio of division of fiscal expenditure for basic and advanced education.

If the total amount of tax revenue increases because L individuals decrease and new H individuals can earn more incomes, L individuals' incomes increase. On the other hand, if the total amount of tax revenue decreases because H individuals' incomes decrease by the decline in the quality for advanced education, then the quality of basic education tends to decrease. As long as the latter effect is weaker than the former effect and the quality of basic education increases, then L individuals' incomes increase and they can move out of poverty. ■

Next, we consider when a hiring policy for skilled jobs is effective for poverty alleviation. The following proposition is introduced.

Proposition 4 *A hiring policy for skilled jobs can alleviate poverty when the differences of the learning abilities of L and H individuals are not large.*

Proof. A hiring policy increases the value of q and a government increases spending on advanced education, as shown in Proposition 1. Therefore, H individuals' incomes increase and the total tax revenue for education increases. This effect tends to increase the quality of basic education and H individuals' incomes. However, the value of λ increases and the share of fiscal expenditure for basic education decreases a lot when a_L and a_H are significantly different. The effect tends to decrease the quality of basic education and L individuals' incomes. Whether L individuals move out of poverty or not depends on the relationship between these two effects.

On the other hand, when a_L and a_H are similar, the effect of a decline of the total amount of fiscal expenditure on basic education is small by change of λ. Therefore, the government can increase spending on basic education and L individuals' incomes can increase. ■

4 Conclusion

We examine the possibility and mechanisms of poverty decline resulting from the following two policies in developing countries: improving learning environments and a hiring policy for skilled jobs in the private sector in developing countries. The main purposes of these policies are apparently not poverty alleviation. However, we find that there is a possibility that the policies increase the quality of education for the poor and their productivity.

A policy for supporting individual learning environments can decrease poverty in two ways. First, some individuals whose learning ability is low cannot concentrate on lectures because they have to work for a living or they are malnourished although their potential understanding is high. The learning ability of such individuals can increase by improving their learning environments. Subsequently, they can receive advanced education and acquire high skills. Second, the government can increase the quality of basic education by decreasing the rate of individuals whose learning ability is low.

We also observe that the aforementioned hiring policy can increase the quality of basic education by increasing the total tax revenue for education as long as the differences in individual learning abilities are similar.

In this way, these policies can encourage the poor to move out of poverty. This fact indicates that poverty alleviation can be realized through diverse policies on education systems, and implies an increase in policy design choices under finite budgets for governments in developing countries.

Appendix A

Let us introduce the value of U_L. From (1), (2), and (4), we obtain

$$U_L = \frac{\nu}{1+\nu}(1-t)^{\frac{1+\nu}{\nu}} a_L^{\frac{1+\nu}{\nu}} E_L^{\frac{\alpha(1+\nu)}{\nu}}. \tag{14}$$

Since

$$E_L^{\frac{\alpha(1+\nu)}{\nu}} = (E_L^{\frac{\nu-\alpha(1+\nu)}{\nu}})^{\frac{\alpha(1+\nu)}{\nu-\alpha(1+\nu)}}, \tag{15}$$

from (9), (14), and (15), (10) is introduced.

Next, we consider the value of U_H. From (1), (2), (5), and (6), we obtain

$$U_H = \frac{\nu}{1+\nu}(1-t)^{\frac{1+\nu}{\nu}} a_H^{\frac{1+\nu}{\nu}} (qE_H^{\frac{\alpha(1+\nu)}{\nu}} - (1-q)E_L^{\frac{\alpha(1+\nu)}{\nu}}). \tag{16}$$

Substituting (8) into (16), yields

$$U_H = \frac{\nu}{1+\nu}(1-t)^{\frac{1+\nu}{\nu}} a_H^{\frac{1+\nu}{\nu}} E_L^{\frac{\alpha(1+\nu)}{\nu}} (q\lambda^{\frac{\alpha(1+\nu)}{\nu}} - 1 + q). \tag{17}$$

From (15) and (17), (11) can be introduced.

AppendixB

To obtain the value of λ that maximizes (12), we assume function F is

$$F = \frac{(pa_L^{\frac{1+\nu}{\nu}} + (1-p)(q\lambda^{\frac{\alpha(1+\nu)}{\nu}} + 1 - q)a_H^{\frac{1+\nu}{\nu}})^{\frac{\nu}{\nu-\alpha(1+\nu)}}}{(p + (1-p)\lambda)^{\frac{\alpha(1+\nu)}{\nu-\alpha(1+\nu)}}}, \tag{18}$$

from (12). From the differentiation of function F with respect to λ, we obtain

$$pa_L^{\frac{1+\nu}{\nu}} + (1-p)(1-q)a_H^{\frac{1+\nu}{\nu}} = pqa_H^{\frac{1+\nu}{\nu}} \lambda^{\frac{-\nu+(1+\nu)\alpha}{\nu}}. \tag{19}$$

Therefore, (13) can be introduced.

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