A self-selection system for poverty alleviation and economic growth

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Abstract

When policymakers enforce a poverty alleviation program, they often face difficulty targeting people who really need aid from the government, due to the asymmetric information about individual productivity. Although the literature shows several self-selection systems, that succeed in targeting people with low productivity, assistance only increases these individuals' income but does not contribute to increasing their productivity. This paper proposes a new self-selection system that boosts not only income but also productivity of unskilled and low-productivity people. The result shows the possibility for poor individuals to increase their income more than the goal determined by the government. Moreover, the policy boosts not only the income of the poor but also that of the rich and contributes to the economic growth in a country.

Keywords: increasing returns to scale, constant returns to scale, loan, poverty alleviation, self-selection, asymmetric information, education

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1 Introduction

While enforcing a poverty alleviation program for people whose incomes are low, policymakers often face a problem in screening, as they cannot target unskilled and low-productivity individuals who need support from social security. This problem results from asymmetric information about individuals' productivity between policymakers and individuals. When skilled and high-productivity people present themselves as low-productivity individuals by decreasing their income and applying for a poverty alleviation program, the government cannot target unskilled and low-productivity people. In order to solve the problem, policymakers often use a self-selection system that realizes that high productivity people to earn higher income by themselves than incomes under the program. Thus, high-productivity people do not have an incentive to apply for a poverty alleviation program under the self-selection system.

In this paper, we propose a new self-selection system that not only boosts the incomes of applicants of the poverty alleviation program but also improves the productivity of the unskilled and the skilled people, contributing to economic growth. We suppose that superior goods that raise the productivity of unskilled people, such as education or job training, are provided to applicants of the program instead of cash transfers. In this case, skilled people lose their incentive to masquerade as unskilled people to obtain the superior goods from the government, since they already have the education for high skill work. Hence, only low-productivity people feel inclined to apply for the program, thus the government can solve the screening problem. This policy is also likely more cost-effective than a simple cash-transfer program. Although the government must pay education costs for applicants, the government can collect all or part of the education costs from applicants after their productivity increases.

Furthermore, we consider a mechanism in which the government relegates the education of applicants to skilled people who do not apply for the program. The government transfers cash to applicants of the program to increase their income to some level. Skilled people can use such cash as they see fit as long as they pay the education costs of applicants after their productivity is increased. When skilled people have a greater benefit than paying of education costs for unskilled people compared to the case in which they masquerade their types as unskilled people and get cash from the government, skilled people reveal their types and self-selection is realized. In

this mechanism, we show that the policy for poverty alleviation that directly includes high productivity people is effective not only in solving the screening problem and boosting the incomes of unskilled people, but also in bringing benefit to the rich and in contributing to economic growth.

The literature on self-selection systems to solve the screening problem has increased rapidly.[1] Nichols and Zeckhauser (1982), Dye and Antle (1986), and Blackorby and Donaldson (1988) point out that in-kind transfers are among the most popular solutions to problems in poverty alleviation. The recent literature analyzing self-selection systems through in-kind transfers include studies by Munro (1992), Anand and Ravallion (1993), and Boadway, Marchand, and Sato (1998). They show that skilled people do not have an incentive to decrease their income to obtain aid from the government, when inferior goods, such as distressed blankets or nonnutritious foods, are provided to applicants of the program instead of cash or superior goods.[2]

Workfare is also a known solution to the screening problem. Besley and Coate (1992) clarifies that workfare gives the skilled people an incentive to reveal their types because it imposes upon applicants to work in the public sector. Since skilled people can earn more in the private sector given the same labor hours, they no longer have incentives to obtain benefits from the government by masquerading as low-productivity people.

Since these two self-selection systems adequately target low-productivity people, they have been adopted in both developing and developed countries. However, these systems do not contribute to boosting the productivity of unskilled people. That is, inferior goods do not motivate low-productivity people to work longer and do not raise their incentives to work. Moreover, under a workfare system, applicants must work in the public sector in hours which may be longer than optimal labor hours. Therefore, they often cannot afford to educate themselves to obtain higher skill. On the other hand, the poverty alleviation program discussed in this paper focuses on increasing the productivity of unskilled people. The transfer of superior goods such as education or job training enables applicants to obtain higher skill and to contribute to economic growth.

In the following section, we examine a mechanism of poverty alleviation

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[1]Boadway (1998) divides self-selection policies into four groups: the use of in-kind transfers, workfare, price controls, and monitoring by welfare administrators.

[2]Nakamura (2007) points out a mechanism that succeeds in self-selection through in-kind transfers of superior goods, urging income redistribution from the rich to the poor in the private sector.

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with the provision of education by the government, which shows that self-selection is realized. Then, we consider a mechanism in which education is provided to the applicants by skilled people in the private sector instead of by the government in Section 3. In Section 4, we compare effects and fiscal expenditures under the two systems examined in the previous sections. The last section presents the conclusions of this study.

2 The Model

We assume that individuals are divided into the following two types according to their marginal productivity levels: L and H. L people have low productivity because these individuals have lower-level skills, while H individuals show high productivity because of their higher skills. The number of the population is N and the proportion of L and H people are γ and $1 - \gamma$, respectively. Asymmetric information between the government and the public, regarding individual productivity levels exists. The individual utility function is written as follows:

$$U_i = a_i l_i - u(l_i), \tag{1}$$

where a_i indicates that the productivity of i type people and $a_L < a_H$ are satisfied, and that the function u indicates costs of labor hours, which we assume is increasing and convex. The derivative of (1) is thus:

$$\frac{\partial U_i}{\partial l_i} = a_i - u^{'}(l_i) = 0. \tag{2}$$

From (2), we find that the optimal labor hours of each person is l_L^* and l_H^*, and $l_L^* < l_H^*$ is satisfied because the function u is convex. Then, $U_L < U_H$ is satisfied.

Moreover, we assume that H people's skill has increasing returns to scale while L people's skill has constant returns to scale.[3] In this case, H people have an incentive to increase their productivity by enlarging the amount of

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[3]Romer (1986) and Murphy et al. (1989) focus on the conversion of skill affecting productivity. When laborers show small-scale production, their skill shows constant returns to scale. On the other hand, when laborers engage in big-scale production, their skill shows increasing returns to scale.

inputs, because their productivity function is increasing and convex. However, there is an upper limit of accommodation loans, and it is the same as their collateral, such as ground rents. The necessity condition under which H people get loans from banks is as follows:

$$a'_H l'^*_H - u(l'^*_H) - (1+r)B - a_H l^*_H + u(l^*_H) > 0. \tag{3}$$

B and r are the upper limit of accommodation loans and an interest rate, respectively, and a'_H and l'^*_H indicate increased productivity by B and the optimal labor hours of H people whose productivity becomes a'_H. Then, $a_H l^*_H < a'_H l'^*_H$ is satisfied. On the other hand, L people do not get loans from banks because they do not have collateral. Moreover, they do not even have an incentive to get loans from banks, because they do not want to increase their labor hours and the amount of production under constant returns to scale.

2.1 The aim of the poverty alleviation programs

An aim of the government within these programs is to raise the income of L people to z, which implies a poverty line, in order to alleviate poverty. The government levies fixed-rate taxation t on incomes more than z for enforcing a poverty alleviation program. Therefore, H people maximize their utility function as follows;

$$U_H = (1-t)a_H l^{**}_H - u(l^{**}_H). \tag{4}$$

The optimal labor hours for H people in this case, l^{**}_H, is introduced by

$$\frac{\partial U_i}{\partial l_i} = (1-t)a_i - u'(l_i) = 0, \tag{5}$$

and $a_L l^*_L < z < (1-t)a_H l^{**}_H$ is satisfied. Suppose that the government provides the applicants education or job training and increases their productivity to be a_H.[4] The education cost for each low-productivity person is e. After providing education and training, the government can collect all or a part

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[4]The possibility exisits that productivity of L people is not increased even if they engage in education. However, for simplicity, we assume that all people who engage in education succeed in raising their productivity, because this assumption does not affect the main result of the model.

of education costs as long as the income of applicants becomes more than z after receiving education.

The needed fiscal expenditure for the policy is $F_e = \gamma N e$. If the inequality

$$(1+r)e < (1-t)(a_H l_H^{**} - z), \tag{6}$$

is realized, the government can collect all education costs. If the inequality

$$(1-t)(a_H l_H^{**} - z) < (1+r)e < (1-t)a_H l_H^{**} - a_L l_L^*, \tag{7}$$

is realized, the government can collect a part of the education costs.[5]

2.2 Human investment by governments and self-selection

Let us consider the utility of both the L and H people under the policy for poverty alleviation by human investment. We consider the two-period model, which indicated the individuals' utility before and after applying for a poverty alleviation program. The government pays education costs e to each applicant whose income is $a_L l_L^*$. Then, they collect education costs as much as possible after productivity of applicants is increased. Since the aim of the government is to raise the income of the applicants to z, the utility function of L people who apply for the program is formed as

$$U_L = a_L l_L^* - u(l_L^*) + \delta((1-t)z - u(l_H^{**})), \tag{8}$$

where δ is the discount rate and $0 \le \delta \le 1$ is satisfied. We assume that (8) is higher than utility without any aid from the government. Therefore, L people choose to apply for the program.

H people have two choices, the first of which is to reveal their types by earning a higher income and opting out of governmental assistance. The utility for H individuals in this case is formed as thus:

$$U_H^r = (1+\delta)((1-t)a_H l_H^{**} - u(l_H^{**})). \tag{9}$$

The other choice for H individuals is to disguise their productivity levels by decreasing their income and applying for the program. The utility for H people in this case is

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[5]The education costs are always less than $(1-t)a_H l_H^{**} - a_L l_L^*$ as we see that skilled people choose to receive education.

$$U_H^m = a_L l_L^* - u(\frac{a_L l_L^*}{a_H}) + \delta((1-t)z - u(l_H^{**})). \qquad (10)$$

When the value of $a_H l_H^{**} - z$ is large to some extent, (9) is higher than (10), because H people must pay the education costs after they show their potential productivity. In this case, H people choose to reveal themselves as belonging to the H group, and only L individuals apply for the program. The government succeeds in self-selection to provide superior goods such as a chance to increase productivity, which is not attractive for H people because they have received this opportunity already.

Proposition 1 *Human investment as poverty alleviation succeeds in solving the screening problem and succeeds in urging applicants of a program to show self-supporting efforts.*

Proof. As long as the government provides goods or opportunities that high-productivity people have already had for alleviating poverty, H people do not have incentives to apply for the program, as we see that (9) is always higher than (10). Since the provided goods such as education are superior goods, the policy contributes to self-supporting of the applicants by increasing their productivity. ∎

3 Human investment in the private sector

In this section, let us consider a mechanism that works by providing education that increases the productivity of L people to each applicant of a poverty alleviation program from H people in the private sector instead of from the government. That is, H people have the incentive to pay the education costs of L people under this mechanism. In this case, the government need not pay education costs and just transfers cash g to each applicant. In this case, $g = z - a_L l_L^*$ and $g < e$ are satisfied.

We assume that the government allows applicants of the program to give their provided cash g to H people. After getting cash from L people, H people make an agreement with the L people to pay education costs for them. H people pay the costs after increasing the productivity of the L people, and the payment is observed by the government.

There are two possible choices for L people after applying for the poverty alleviation program. First, the utility of L individuals who apply for the program is formed as follows:

$$U_L = a_L l_L^* - u(l_L^*) + \delta((1-t)(a_L l_L^* + g) - u(l_L^*)). \tag{11}$$

Second, the utility of L people who apply for the program and give cash g to H people is as follows:

$$U_L = a_L l_L^* - u(l_L^*) + \delta((1-t)(a_H l_H^{**} - u(l_H^{**}))). \tag{12}$$

It is found that (12) is always higher than (11).

Next, let us consider the utility of H people under the program. There are three choices for H people. First, they can reveal their type by earning a high income and opt not to be involved in the poverty alleviation program. In this case, the utility of H people is shown as (9). Second, they can masquerade as L people and apply for the program. The utility function in this case becomes thus:

$$U_H^m = a_L l_L^* - u(\frac{a_L l_L^*}{a_H}) + \delta((1-t)(a_H l_H^{**} + g) - u(l_H^{**})). \tag{13}$$

When (13)<(9) is realized, the screening problem is observed and we consider the case.

Third, H people can make an agreement with some L people and collect money that is provided by the government to the L people. If (3) is not satisfied, it clarifies that H people do not have an incentive to obtain loans from banks in the private sector. They cannot increase their productivity at the level of attaining benefit because there is an upper limit of loans from banks. However, there is the possibility that H people get benefit from loans if their upper limit is eliminated, since their skill increases returns to scale.[6] The amount of loans which an H person gets is ng, where n is the number of L people from whom an H person gets loans. The utility of H people who get loans from some L people is shown as follows:

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[6]We notice that H people have no incentive to pay education costs of H people who masquerade as L people for applying to the program. The payment of education costs is observed and is inevitable for H people who make an agreement. If H people masquerade as a different type of skill level to apply for the program and get cash from the government, such people and H people who pay education costs must divide the benefit from loans into halves. In this case, H people always make an agreement with L people.

$$U_H^r = (1-t)a_H l_H^{**} - u(l_H^{**}) + \delta((1-t)a_H' l_H'^* - n(1+r)e - u(l_H'^*)), \quad (14)$$

where a_H' implies increased productivity through additional capital invest-
ment generated by ng, and the degree of a_H' depends on the amount of the
investment. Under the program, H people have an incentive to get loans
as long as possible. However, the upper limit of the loans is observed, even
if there is not an explicit agreement. This limit is determined by the labor
hours of H people, since there is an upper limit of periods of production
activity.

If (13) is higher than (14), H people masquerade as another type of
productivity level and get cash g from the government. On the other hand,
H people reveal their types and get loans ng from L people if (14) is higher
than (13), and as a result, this program succeeds in self-selection.

Proposition 2 *Governments can realize self-selection and target low-productivity
people by allowing applicants to give provided cash from the government to
high productivity people instead of entering an agreement that high-productivity
people pay education costs of low-productivity people.*

Proof. H people can increase their productivity by capital investment, and
the degree of increased peoductivity depends on the amount of loans. H
people can get loans from the government through L people as much as
possible when H people take on the duty to educate L people. That is,
there is a possibility that H people increase their utility by getting unlimited
loans. In this case, H people choose to reveal their type and self-selection is
realized. ■

Proposition 3 *Poverty alleviation programs that involve high-productivity
people have a direct possibility for the income of applicants to exceed the
desired value of the program determined by governments.*

Proof. When the government educates low-productivity people, the income
of applicants after education becomes z, which is the aim of the poverty
alleviation program as we see in (8). On the other hand, the income of L
people can be more than z if H people pay the education costs of L people
as shown in (12). ■

4 Comparison of two poverty alleviation programs

We examined the two poverty alleviation programs in previous sections. Under one program, the government provides education costs e to each applicant to raise his or her productivity and achieves the goal for all people to have an income more than z. Under the other program, the government transfers cash g to each applicant and allows H people to educate applicants instead of obtaining g. In this section, we compare effects to L and H people and the fiscal expenditure realized by these programs.

4.1 Effects of two mechanisms on L and H people

The utility function of L people under the former policy is formed as (8), while their utility function under the latter one is formed as (12) when both mechanisms succeed in self-selection. Since (8) $<$(12) is satisfied, for L people, education in the private sector is better than that by the government.

On the other hand, the former policy has no effects on H people because they choose to reveal their type, and their utility is not changed by the program. When education for L people is performed in the private sector by H people under the latter policy, the utility of H people becomes (14). This is higher than (9), in which H people do not apply for the program as long as there is no upper limit of loans for H people. Therefore, the latter policy is also more beneficial for H people.

Proposition 4 *Poverty alleviation programs that involve high-productivity people contribute to economic growth by increasing productivity of all people in a country.*

Proof. Since the skill of H people increases returns to scale, they can use cash more effectively than L people, whose skill has constant returns to scale. Therefore, not only L people who take education under the program, but also H people who use unlimited cash from the government have the opportunity to increase their productivity and contribute to economic growth. ∎

4.2 Fiscal expenditure

Under the system in which the government pays education costs for applicants, the policymaker can collect the costs as long as incomes of applicants

are not less than z. Moreover, the government can collect the income greater than z if (6) is satisfied. Hence, the government revenue from the program is as follows:

$$F_1 = \gamma N(a_H l_H^{**} - (1+r)e - z). \tag{15}$$

On the other hand, when H people pay the education costs of L people, the government transfers cash g to each applicant, and the government cannot collect it. However, the government revenue from tax increases due to the raising productivity of L and H people. Therefore, the government revenue from the program is as follows;

$$F_2 = (1-\gamma)N(1-t)(a'_H l'^*_H - a_H l_H^{**} - n(1+r)e) + \gamma N(1-t)a_H l_H^{**} - \gamma Ng. \tag{16}$$

It is found that (16) can be more than (15), where the tax rate t and increased productivity $a'_H l'^*_H$ are great to some extent. In this case, the government has an incentive to choose the latter policy which affects the productivity of both L and H people.

Proposition 5 *A government gets a lot of revenue through a poverty alleviation program that affects the productivity not only of unskilled people, but also of skilled people.*
Proof. *H people use transferred cash more effectively than L people do, because the skill of H people increases returns to scale. Therefore, the increased tax revenue from H people can exceed the expenditure for poverty alleviation.* ∎

5   Conclusion

In this paper, we proposed poverty-alleviation programs that successfully result in self-selection. When the government supports the low-income people by transferring superior goods such as education, which high-productivity people have, skilled people do not have the incentive to masquerade as a different skill types and do not get aid from the government. Since superior goods increase the productivity of the poor, the policy contributes to economic growth, compared to other poverty alleviation programs such as workfare or traditional in-kind transfers.

Moreover, the government can boost the productivity and incomes of skilled people as well as those of unskilled people through the policy. By allowing the skilled people to use cash provided to the poor from the government instead of paying education costs of unskilled people, the skilled people can increase their productivity, because their skill increases returns to scale. This factor also contributes to economic growth.

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