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Efficient Income Redistribution under Asymmetric Information

Yui Nakamura
Faculty of Economics, Fukuoka University

Abstract

This paper discusses the possibility that the presence of asymmetric information may provide more efficient income redistribution than the presence of symmetric information when the focus is on the screening problem although asymmetric information is known to cause inefficient income redistribution. The screening problem is caused when a government intervenes to alleviate poverty. Asymmetric information between individuals and the government regarding individual productivity makes it difficult for the government to target deserving individuals. A lot of studies explain that in-kind transfers, especially inferior goods, such as social housing in small apartments, or low quality wheat or rice, can succeed in solving the problem, although such goods cannot increase the poor's self-supporting efforts to escape from poverty. In this paper, we also find that not only inferior goods but also superior goods which contribute to the poor's self-supporting efforts to escape from poverty can solve the screening problem.

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Contact: Yui Nakamura - nakamuray@fukuoka-u.ac.jp.
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1 Introduction

Asymmetric information is known to cause inefficient resource allocation or inefficient income redistribution, as the theory of physician-induced demand, principal-agent theory, and the screening problem indicate. This paper focuses on the screening problem and demonstrates that more efficient income redistribution can be realized even when asymmetric information exists compared with a situation under symmetric information.

The screening problem is caused when a government intervenes to alleviate poverty. Asymmetric information regarding individual productivity makes it difficult for the government to target deserving individuals. As Nichols and Zeckhauser (1982), Dye and Antle (1986), and Blackorby and Donaldson (1988) point out, in-kind transfers are a known solution to this problem. Moreover, in recent years, Coady, Grosh, and Hoddinott (2004), Gahvari and Mattos (2007), Currie and Gahvari (2008), and Tiba (2011) explain that inferior goods, such as social housing in small apartments, or low quality wheat or rice, can succeed in solving the problem, although such goods cannot increase the poor's self-supporting efforts to escape from poverty. In this paper, we indicate the possibility that not only inferior goods but also superior goods can increase the poor's self-efforts and also solve the screening problem.

In the following section, we examine a standard model of the screening problem and two types of superior goods that can solve the problem. In Section 3, we demonstrate the possibility that effective income redistribution can be realized even when asymmetric information exists and the final section concludes.

2 The Model

2.1 Goods bringing opportunity costs

First, to indicate inefficient income redistribution caused by the screening problem under asymmetric information, we show a model based on Nakamura (2007).

Individuals are divided into two types, L and H: L's individual productivity is low because they have low skills while H's individual productivity is high because they have high skills. Productivity for each is written as a_L

and a_H, respectively. Their utility function is formed as

$$U_i = a_i l_i - h(l_i + s), \tag{1}$$

where l_i is productive labor hours for i individuals and s is non-productive but necessary hours for domestic work, nursing care of parents, or child rearing. We assume that s is constant and that h is a disutility function that is convex. The optimal labor hours for individual i, l_i^* can be introduced as

$$\frac{\partial U_i}{\partial l_i} = a_i - h'(l_i + s) = 0. \tag{2}$$

Since h is convex, the income of H individuals $a_H l_H^*$ is always higher than L's income, $a_L l_L^*$.

We assume that the government transfers some goods to the L individuals to increase their incomes to a poverty line z and $a_L l_L^* < z < a_H l_H^*$ is satisfied. The goods contribute to a decrease in non-productive hours s. For example, coupons of licensed baby-sitters or care assistants can decrease the applicants' domestic time (i.e., nonproductive) time available for child-rearing or nursing care of parents.[1] Quantitatively, the time made available by the provided good must be shown as

$$t = \frac{g}{a_L}, \tag{3}$$

where $g = z - a_L l_L^*$, and $t < s$ are satisfied. The utility function of L individuals under the program becomes

$$\begin{aligned} U_L^1 &= a_L(l_L^* + t) - h(l_L^* + s) \\ &= z - h(l_L^* + s). \end{aligned} \tag{4}$$

Conversely, the utility function of H individuals can be classified into two types. First, if they do not apply for the program and earn high income by themselves, then their utility function is formed as

$$U_H^{r1} = a_H l_H^* - T_1 - h(l_H^* + s), \tag{5}$$

[1] Nakamura (2007) points transportation between individual living places and places for drawing water as an example of provided goods from the government in developing countries. Using transportation, this poverty-alleviation program saves domestic time requirements and increases productive labor hours and incomes.

where T_1 is a lump-sum tax for realizing the program. Second, if they apply for the program while decreasing their labor hours and incomes, then their utility function is written as

$$U_H^{m1} = z - h(\frac{z}{a_H} + s - t). \tag{6}$$

When the utility level shown by (6) is more than (5), the screening problem under this program is observed. That is, all individuals apply for the program and the government fails to target L individuals.

To solve this problem, we assume that the government allows the applicants of the program to sell their program-provided goods in the market as long as their income keeps the level of z. That is, H individuals can obtain the provided goods from L individuals without applying for the program. In this case, the utility function for L individuals is formed as

$$U_L^{s1} = a_L l_L^* + p_1 - h(l_L^* + s), \tag{7}$$

whereas the utility function of H individuals can be

$$U_H^{b1} = a_H(l_H^* + t) - T_1 - p_1 - h(l_H^* + s). \tag{8}$$

p_1 implies the price of the provided goods in the market. The extent of p_1 is introduced by the difference between (4) and (7), and (5) and (8) as

$$a_L t = g \leq p_1 \leq a_H t. \tag{9}$$

The utility level of L individuals shown by (7) is the same or larger than (4). Therefore, L individuals have an incentive to sell their provided goods to H individuals rather than using them. In contrast, the utility level shown by (5) is the same or smaller than (8); therefore, when the utility level shown by (8) is more than (6), H individuals reveal their types through buying the provided goods from the government in the market and the screening problem can be solved.[2] The larger the difference of the opportunity costs between L and H individuals, the more this program succeeds in targeting L individuals.

[2]When the population of L individuals is the same or more than that of H individuals, the problem is solved perfectly. Conversely, if the population of H individuals is more than L individuals, then all H individuals cannot buy the goods from the L individuals, and the problem remains partly unsolved.

2.2 Goods bringing knowledge

In this section, we consider another property of provided superior goods from the government that can also solve the screening problem. The government provides the applicants with coupons to consult specialists, such as lawyers, tax accountants, or consultants, about the efficiency of their jobs and to obtain information and knowledge that can increase their productivity. With the specialists' advice, L individuals can increase their productivity from a_L to a'_L, where $a_L < a'_L$ is satisfied. To increase the incomes of L individuals to the poverty line z, the government provides coupons to make a situation as follows:

$$a'_L l'^*_L = z, \tag{10}$$

where l'^*_i is the optimal labor hours for individual i whose productivity is a'_i. The utility level of L individuals under the program becomes

$$\begin{aligned} U^2_L &= a'_L l'^*_L - h(l'^*_L + s) \\ &= z - h(l'^*_L + s). \end{aligned} \tag{11}$$

Conversely, H individuals have two choices regarding when they face the program. First, if they do not apply for the program and earn high income by themselves, then their utility function is formed as

$$U^{r2}_H = a_H l^*_H - T_2 - h(l^*_H + s), \tag{12}$$

where T_2 is a lump-sum tax for realizing the program. Second, H individuals increase their productivity from a_H to a'_H, where $a_H < a'_H$ is satisfied, by applying for the program as masquerading their types. In this case, their utility function is

$$U^{m2}_H = z - h(\frac{z}{a'_H} + s). \tag{13}$$

When the utility level shown by (13) is more than (12), the screening problem occurs.

To solve this problem, the government allows the applicants to sell their program-provided goods in the market as long as their income keeps the level of z. In this case, the utility function of L individuals is formed as

$$U^{s2}_L = a_L l^*_L + p_2 - h(l^*_L + s), \tag{14}$$

whereas the utility function of H individuals when they buy coupons from L individuals in the market as revealing their type can be

$$U_H^{b2} = a'_H l'^*_H - T_2 - p_2 - h(l'^*_H + s), \tag{15}$$

where p_2 is the price of the provided goods in the market. The extent of p_2 is introduced by the difference between (11) and (14), and (12) and (15) as

$$g - h(l'^*_L + s) + h(l^*_L + s) < g \leq p_2 \leq a'_H l'^*_H - a_H l^*_H - h(l'^*_H + s) + h(l^*_H + s). \tag{16}$$

The utility level for L individuals shown by (14) is larger than (11). Therefore, they have an incentive to sell their coupons to H individuals rather than to use them. On the other hand, the utility level shown by (15) is the same or more than (12). Therefore, when the utility level shown by (15) is more than (13), H individuals reveal their types through buying the coupons in the market and the screening problem can be solved. The larger the difference of the given knowledge between L and H individuals, the more this program succeeds in targeting L individuals.

From the results presented in Sections 2.1 and 2.2, we find that there is the possibility that the government can solve the screening problem by not only inferior goods but also superior goods.

Proposition 1 *A government can solve a screening problem by transferring in-kind superior goods.*

Proof. When the government allows the applicants of the program to sell the provided goods in the market, high productive individuals can buy them from low productive individuals, which reveals their types. In this case, the government can target low productivity individuals and the screening problem can be solved. ■

3 Effective Income Redistribution under Asymmetric Information

In this section, we compare the effectiveness of income redistribution from H to L individuals under both symmetric and asymmetric information. Under symmetric information, the government can observe both individual incomes

and productivity whereas under asymmetric information, it can observe individual incomes but not individual productivity. Under symmetric information, L individuals can earn z using the provided goods from the government that are made by tax from H individuals. However, under asymmetric information, there is a possibility that L individuals can get more than z by income redistribution from H individuals when L and H individuals buy and sell the provided goods from the government in the market.

Proposition 2 *The presence of asymmetric information may provide more efficient income redistribution than that of symmetric information.*

Proof. Low productivity individuals earn z using the goods from the government. However, high productivity individuals can earn more than z using the goods that increase labor hours or labors' productivity since high productivity individuals have higher opportunity costs or knowledge to use the goods. Therefore, they afford to pay the higher price than g for the goods as shown in (9) and (16). ■

4 Conclusion

In this paper, we consider the screening problem, which often occurs under asymmetric information and find the following two results. First, we show that not only inferior goods but also superior goods can solve the problem. This fact implies that the quality of life for the poor can increase through a poverty alleviation program compared with a program of just providing inferior goods. Second, challenges our common perception: there is a possibility that more effective income redistribution from the rich to the poor can be realized under asymmetric information compared with the case under symmetric information.

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