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Comparative institutional analysis of poverty-alleviation systems*

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Abstract

This paper conducts a comparative institutional analysis of welfare benefits programs and basic income under the balanced budget condition. The result shows that when basic income is low, it yields higher social welfare than welfare benefits. Also, the equilibrium employment under the basic income system is larger than that under welfare benefits programs when the welfare benefits level is lower than the critical level.

Keywords: Comparative institutional analysis, Basic income, Welfare benefit

JEL codes: H2, H5, I3

Declarations of interest: None

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1 Introduction

Poverty is a serious problem in many countries around the world. Many governments have adopted welfare benefits programs as a tool to reduce poverty. In recent years, however, there has been growing interest in basic income as a new instrument for poverty reduction. The basic income system was proposed by Atkinson (1996) and is expected to solve the disadvantages of welfare benefits programs that include high costs to the government and the poor associated with the means test, the complexity of the system, and stigma.

Kleven and Kopczuk (2011) present a model of screening in welfare benefits programs. In their model, an optimal welfare system is proposed based on the trade-off between targeting efficiency and incomplete take-up by raising screening intensity. Many economists have considered the effects of welfare programs on labor supply. Moffitt (2002) presents a review of empirical and theoretical researches on the effect of welfare systems on labor supply.

Ghatak and Maniquet (2019) present theoretical aspects of the basic income system, particularly, they explain the desirability and feasibility of basic income. Cremer and Roeder (2015) present the political economy model in which welfare benefits programs means testing or basic income system is adopted by voting.

This paper presents a comparative institutional analysis of the welfare and basic income systems under the balanced budget condition. I find that, when the level of basic income is high, basic income yields lower social welfare than welfare benefits programs. The equilibrium employment under the basic income system is larger than that under welfare benefits programs when the welfare benefits level is lower than the critical level.

The rest of this paper is arranged as follows: Section 2 explains the basic setting of the model; Section 3 analyzes the players' behavior under the basic income system; Section 4 analyzes the players' behavior under the welfare benefits system; Section 5 conducts a comparative institutional analysis, and the final section contains my conclusions.

2 Model

The basic setting follows Besley and Coate (1992) and Kurita et al. (2020). There is an economy with a finite player set I. The population is divided into two classes: poor and rich. The proportion of the poor class in the total population is $\beta \in (0, 1)$. Furthermore, the poor class is split into needy and non-needy types. The proportion of the needy type in the poor class is $\gamma \in (0, 1)$. To make the notation easier to read, we describe the needy poor as type 1, the non-needy poor as type 2, and the rich as type 3.

Following Besley and Coate (1992), I assume that the needy poor individuals cannot work while the non-needy poor can work and earn work income ω. Formally, the non-needy-poor players have two actions $a_i \in \{W, N\}$, where W corresponds to working and N corresponds to not working, $i \in I_2$, I_2 is the set of non-needy poor players, and $I_2 \subset I$. If non-needy-poor players choose to work, they suffer from labor disutility θ, and θ is uniformly distributed in $\Theta \in [0, 1]$. For simplicity, the size of the total population is assumed to be 1.

The rich class (type 3) has the following utility:

$$U_3 = u(c_3), \tag{1}$$

$$c_3 = y - t, \tag{2}$$

where $u(\cdot)$ is the well-behaved concave utility function from consumption, y is the income for the rich, and t is the tax, which is determined by the government budget constraint. The utility for the poor class (type 2 and 3) is shown in the next section.

Labor market is assumed to be perfectly competitive and the price of product is normalized to be 1. The firm's production function is $F(L)$ and the first order condition is give by

$$F'(L) = w. \tag{3}$$

To obtain the solution analytically, we assume $F'(L) = \alpha$, α is the positive.

3 Basic income system

The model compares the *Basic Income* institution with the *welfare benefit* institution. Let *BI* and *WB* denote *basic income* and *welfare benefit* . Under *BI*, all players receive basic income B, and the government budget constraint is given by

$$(1-\beta)t = B. \tag{4}$$

In (4), the left-hand side is the tax revenue, and the right-hand side is the total cost for *BI*. The balanced tax under *BI* is as follows:

$$t_{BI} = \frac{B}{1-\beta}. \tag{5}$$

The utilities for the needy poor (type 1) and the rich (type 3) are given as follows:

$$U_1 = u(B), \tag{6}$$

$$U_3 = u(y + B - t_{BI}), \tag{7}$$

Here, by the government budget constraint (4), the net income for the rich class is given by:

$$y + B - t_{BI} = y - \frac{\beta}{1-\beta}B. \tag{8}$$

That is, the basic income system reduces income for the rich, and the result is natural.

Non-needy poor (type 2) players have utility as follows:

$$U_2 = \begin{cases} u(\omega + B) - \theta & \text{if } a_{i\in I_2} = W, \\ u(B) & \text{if } a_{i\in I_2} = N, \end{cases} \tag{9}$$

Non-needy poor players make decisions under a trade-off between increasing income by working with labor disutility and giving-up working income without disutility. We define the critical level of θ as follows:

$$u(\omega + B) - \hat{\theta}_{BI} = u(B), \tag{10}$$

Equation (10) indicates that the non-needy poor-type players with $\theta \geq \hat{\theta}_{BI}$ prefer not to work and the others prefer to work. For notation simplicity, let θ_- and θ_+ denote $\theta < \hat{\theta}$ and $\theta \geq \hat{\theta}$.

The equilibrium employment under BI is given by

$$L_{BI}(\omega) = \beta\gamma[u(\omega + B) - u(B)], \tag{11}$$

For the analytically simplicity, I specify the utility function as the following constant relative risk aversion utility function,

$$u(c) = \frac{c^{1-r} - 1}{1 - r}, \tag{12}$$

where r is the degree of relative risk aversion and $r \leq 1$. The inverse labor supply function $(\omega_{BI}(L))$ is as follows:

$$\omega_{BI}(L) = \left(\frac{1 - r}{\beta\gamma}L + B^{1-r}\right)^{\frac{1}{1-\gamma}} - B. \tag{13}$$

From (3) and (13), we obtain the following market clear condition:

$$\alpha = \left(\frac{1 - r}{\beta\gamma}L + B^{1-r}\right)^{\frac{1}{1-\gamma}} - B. \tag{14}$$

Equilibrium outcomes are summarized in the following proposition:

Proposition 1 *In the equilibrium under BI, the following outcomes realize:*

equilibrium employment is given by

$$L^*_{BI} = \frac{\beta\gamma}{1-r}[(\alpha + B)^{1-r} - B^{1-r}],$$

The utility of the needy type player is given by

$$U^*_{1,BI} = \frac{B^{1-r} - 1}{1-r},$$

the utility of the non-needy type player with θ_- is given by

$$U^*_{2,BI,W} = \frac{(\alpha + B)^{1-r} - 1}{1-r} - \theta,$$

the utility of the non-needy type player with θ_+ is given by

$$U^*_{2,BI,N} = \frac{B^{1-r} - 1}{1-r},$$

the utility of the rich player is given by

$$U^*_{3,BI} = \frac{\left(y - \frac{\beta}{1-\beta}B\right)^{1-r} - 1}{1-r}.$$

Proposition 1 shows the straightforward results. Because basic income is a very simple and universal scheme, the effect of a change in the level of basic income on equilibrium is intuitive.

4 Welfare benefit system

Next, I analyze the welfare benefits system *WB*. Under *WB*, players need to claim taking-up welfare if they hope to obtain welfare. For simplicity, all claimers in poor class players can take up welfare, following Besley and Coate (1992). The actions for non-needy-type players

must be reconsidered: *working without welfare* or *taking up welfare without working*. Let W and N denote the former and latter, respectively. Furthermore, needy-type players have choices: *taking up welfare* (T) or *not* (NT).

The level of welfare benefit is $b(<\omega)$, and the non-needy player's utility is as follows:

$$U_2 = \begin{cases} u(\omega) - \theta & \text{if } a_{i\in I_2} = W, \\ u(b) & \text{if } a_{i\in I_2} = N. \end{cases} \tag{15}$$

This setting reflects that the government can confirm the employment status of welfare claimers; however, it cannot confirm *eligibility*. Besley and Coate (1992) calls taking-up welfare by the non-needy type players *welfare fraud*. The critical level of θ under the WB institution is as follows:

$$\hat{\theta}_{WB} = u(\omega) - u(b), \tag{16}$$

The needy poor players'utility is given by

$$U_1 = \begin{cases} u(b) & \text{if } a_{i\in I_1} = T, \\ u(0) & \text{if } a_{i\in I_1} = NT, \end{cases} \tag{17}$$

Thus, since b is positive, all the needy-type players take up welfare.

The rich class has the following utility:

$$U_3 = u(y - t_{WB}), \tag{18}$$

where t_{WB} is determined by the following government budget constraint:

$$(1-\beta)t_{WB} = bm. \tag{19}$$

Here, m is the total number of players who take up welfare benefits and

$$m = \beta[\gamma + (1-\gamma)(1-\hat{\theta}_{WB})]. \tag{20}$$

Equilibrium outcomes are summarized in the following proposition:

Proposition 2 *In the equilibrium under WB, the following outcomes realize: equilibrium employment is given by*

$$L^*_{WB} = \frac{\beta\gamma}{1-r}[\alpha^{1-r} - b^{1-r}],$$

the utility of the needy type player is given by

$$U^*_{1,WB} = \frac{b^{1-r}-1}{1-r},$$

the utility of the non-needy type player with θ_- is given by

$$U^*_{2,WB,W} = \frac{\alpha^{1-r}-1}{1-r} - \theta,$$

the utility of the non-needy type player with θ_+ is given by

$$U^*_{2,WB,N} = \frac{b^{1-r}-1}{1-r},$$

the utility of the rich player is given by

$$U^*_{3,WB} = \frac{\left(y - \frac{b\beta}{1-\beta}\left[\gamma + (1-\gamma)\left(1 - u(\alpha) + u(b)\right)\right]\right)^{1-r} - 1}{1-r}.$$

From Proposition 1 and 2, the equilibrium outcomes in the welfare benefits system are more complex than those in the basic income system. The reason is that players consider the decision to take up (or not take up) welfare under the welfare benefits system.

5 Comparative institutional analysis

5.1 Social welfare comparison

This section provides a comparative institutional analysis of basic income and welfare benefits. Following Atkinson et al. (1970), I define the social welfare function as follows:

$$SW = \beta\left[\gamma u_1(c_1) + (1-\gamma)u_2(c_2)\right] + (1-\beta)u_3(c_3). \tag{21}$$

The social welfare defined in (21) is the specific case of Atkinson et al. (1970). From Proposition 1, social welfare under BI is given by

$$SW_{BI} = \beta\left[\gamma u_1(B) + (1-\gamma)\left\{\hat{\theta}_{BI}u_2(\alpha+B) + (1-\hat{\theta}_{BI})u_2(B)\right\}\right] + (1-\beta)u_3(y-t_{BI}). \tag{22}$$

From Proposition 2, social welfare under WB is given by

$$SW_{WB} = \beta\left[\gamma u_1(b) + (1-\gamma)\left\{\hat{\theta}_{WB}u_2(\alpha) + (1-\hat{\theta}_{WB})u_2(b)\right\}\right] + (1-\beta)u_3(y-t_{WB}). \tag{23}$$

Figures 1, 2, and 3 show a comparison of social welfare under the BI and the WB. Figures 1, 2, and 3 correspond to the numerical plots with low, middle, and high relative risk aversion. By numerical plotting, we obtain the following result:

Result 1 *Social welfare under basic income is higher than welfare benefits when basic income and welfare benefits are low. Social welfare under welfare benefits is higher than basic income, otherwise.*

Although the shape of the curve by numerical plotting differs depending on the parameter setting, there is a common tendency for social welfare to be large or small. When basic income is low, basic income yields higher social welfare than welfare benefits, while welfare benefits achieve higher social welfare than basic income. The implication is as follows: An increase in basic income has a positive effect of improving the utility level for the poor class and a

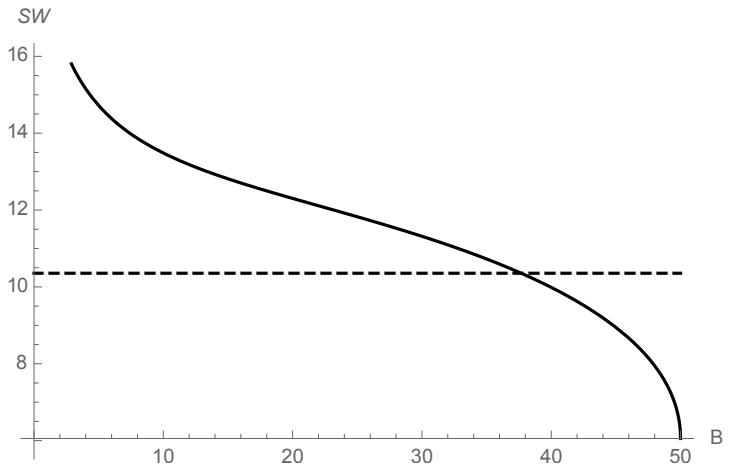

Figure 1: Social welfare comparison with low relative risk aversion

Notes: The figure shows a numerical plot of social welfare. The solid line corresponds to SW_{BI}, and the dashed line corresponds to SW_{WB}. The parameter setting: $b = 10$, $\beta = \gamma = 0.5$, $\alpha = 15$, $y = 100$ and $r = 0.5$.

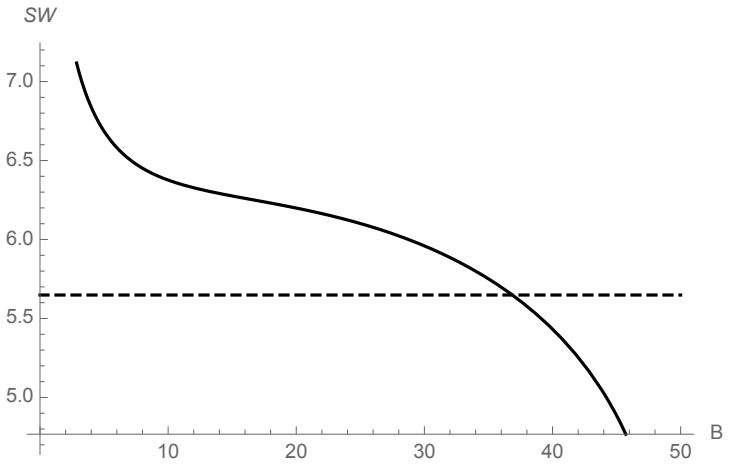

Figure 2: Social welfare comparison with middle relative risk aversion

Notes: The figure shows a numerical plot of social welfare. The solid line corresponds to SW_{BI}, and the dashed line corresponds to SW_{WB}. The parameter setting: $b = 10$, $\beta = \gamma = 0.5$, $\alpha = 15$, $y = 100$ and $r = 0.75$.

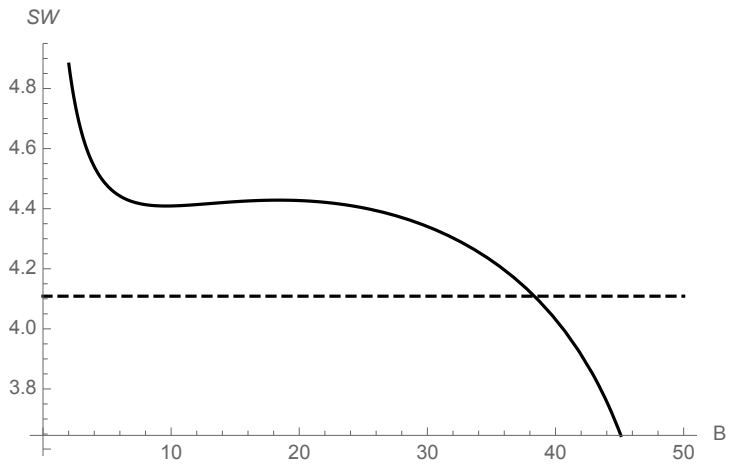

Figure 3: Social welfare comparison with high relative risk aversion

Notes: The figure shows a numerical plot of social welfare. The solid line corresponds to SW_{BI}, and the dashed line corresponds to SW_{WB}. The parameter setting: $b = 10$, $\beta = \gamma = 0.5$, $\alpha = 15$, $y = 100$ and $r = 0.9$.

negative effect of reducing that for the rich class. Meanwhile, an increase in welfare benefits has a positive and negative effect, similar to basic income. However, basic income is provided to all players, while welfare benefits are provided only to players who claim them. This difference generates a different impact on each social welfare. That is, basic income will have a more substantial negative effect as the institution becomes more tolerant of the poor.

5.2 Equilibrium employment comparison

I compare the equilibrium employment between *BI* and *WB*. The equilibrium employment is expressed as follows:

$$L^*_{BI} = \beta\gamma[u(\omega + B) - u(B)], \tag{24}$$

$$L^*_{WB} = \beta\gamma[u(\omega) - u(b)], \tag{25}$$

Figure 4 draw the numerical plotting of L^*_{BI} and L^*_{BI} with the constant relative risk aversion utility function (12).

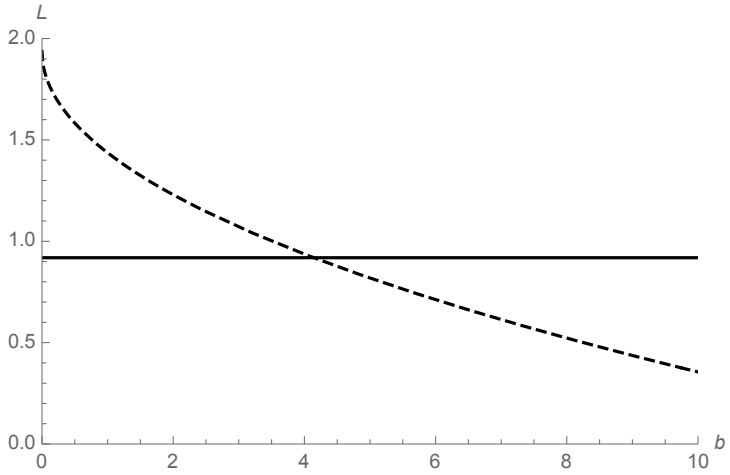

Figure 4: Equilibrium employment comparison

Notes: The figure shows the numerical plot of the equilibrium employment with respect to b. The solid line corresponds to L^*_{BI}, and the dashed line corresponds to L^*_{WB}. The parameter setting: $\beta = \gamma = 0.5$, $\alpha = 15$, $y = 100$, $r = 0.5$ and $B = 10$.

As shown in figure 4, the equilibrium employment under the welfare benefit system is lower than that under the basic income system when the benefit level exceeds a critical level b^*. b^* is expressed as follows:

$$b^* = [\alpha^{1-r} + B^{1-r} - (\alpha + B)^{1-r}]^{\frac{1}{1-r}}. \tag{26}$$

The implication is as follows: When the benefit level is lower than b^*, many players choose to work because the incentive to take up welfare is weak, and when the benefits level is larger than b^*, many players choose to take up welfare.

6 Conclusion

In this paper, I present a comparative institutional analysis of basic income and welfare in an economy with three types of players: the needy poor, the non-needy poor, and the rich. The contribution of this paper is to show that a basic income system can be either better or worse than welfare benefits programs and that a higher level of basic income results in lower

social welfare than welfare benefits programs.

There is a problem of *stigma* in welfare benefits programs (Besley and Coate, 1992). Stigma can reduce the incentive to take up welfare for eligible poor people, as shown in Kurita et al. (2020) and Itaya and Kurita (2020)[1]. I will extend the model in this paper to contain endogenous welfare stigma, welfare fraud, and incomplete take-up welfare as future work. It is essential to consider institutions' determination mechanisms in comparative institutional analysis (Aoki, 2007). I will endogenize the determination of poverty-alleviating institutions in the model in future research.

[1]It is called *non-take-up welfare* or *incomplete take-up* that eligible poor people do not claim to take up.

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