E C O N O M I C S B U L L E T I N

Intergenerational Transfer and Effective Demand

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Abstract

This paper analyzes the effect that an intergenerational redistribution policy has on effective demand by introducing the monetary stagnation model into an overlapping generations economy. We show that the redistribution from a younger generation to an older generation worsens effective demand and the employment rate.

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1 Introduction

The intergenerational problem cannot be disregarded when considering economic policy in recent years. For example, the problem of distribution between generations is related to policy issues such as the payment of pensions or the medical burden of an aging population. Attempting to analyze these problems with a method of analysis that assumes full employment conditions means that, even if an intergenerational redistribution policy is conducted, demand is still maintained by a supply level that results in full employment. Therefore, the supply-side analysis of the neo-classical model cannot analyze the effects of an intergenerational redistribution policy on unemployment and effective demand. If the problem of distribution between generations is considered in a Keynesian monetary economy, we can consider what influence an intergenerational redistribution policy has on effective demand.

The present analysis is motivated by two important issues in Japan, effective demand shortage and public pension scheme.[1]Therefore, this paper implements the analysis of social security in an economy under stagnation. To analyze this problem, we follow Ono (1994, 2001), who introduces a dynamic stagnation model under perfect foresight and perfect competition. However, Ono's representative agent model cannot deal with the problem of distribution. Consequently, in this paper, we apply the characteristics of the monetary economy developed by Ono (2001) to the overlapping generations model. This enables us to consider the intergenerational problem in an economy characterized by unemployment and a shortage of effective demand, and to analyze how to attain an effective level of demand.

New Keynesian economists, such as Marquardt (1998), Corneo and Marquardt (2000) and others, have examined the effect of intergenerational redistribution on economic growth in an economy characterized by unemployment. However, the existence of unemployment in these studies was produced from an assumption of fixed wages in an imperfect labor market, such as a labor union and efficient wages, and the level of effective demand was not determined endogenously by individual optimization. In these studies, it was assumed that the effective demand and the unemployment rate were not affected by the intergenerational redistribution carried out by the social security system. By contrast, in this paper, intergenerational redistribution affects the effective demand and the employment rate because these are de-

[1]See Krugman (1999) for the characterization of stagnation in Japan.

termined endogenously by individual optimization.

Like Ono (1994), we follow Keynes (1936) and consider an economy with a sluggish wage adjustment mechanism and an insatiable liquidity preference agent. Then, money plays a role, not only as a means of storing wealth or as a means of transaction,[2] but also the holding of money itself provides direct utility through the liquidity preference or status preference.[3] When the individual liquidity preference is insatiable, the economy falls permanently into a situation where there is a shortage of effective demand, even if the economy is perfectly competitive, and involuntary unemployment results. The purpose of this paper is to investigate the effects of an intergenerational redistribution policy on effective demand under conditions of economic stagnation.

2 The Model

2.1 Households

The economy begins in period 0, and a cohort born in period t is called generation t. The population of each generation is normalized to one. The first and second periods of the agents' lifetimes are referred to as young and old, respectively. The agents derive utility from consumption and from holding money when they are young and old. Thus, the utility of agents in generation t is expressed as:

$$U = u(c_t^y) + v(m_t^y) + \delta[u(c_{t+1}^o) + v(m_{t+1}^o)], \tag{1}$$

where c_t^y and c_{t+1}^o denote the consumption of the young and old, respectively, m_t^y and m_{t+1}^o denote the real money demand of the young and old, respectively, and $\delta(\in(0,\ 1))$ is the subjective discount factor. $u(\cdot)$ and $v(\cdot)$ satisfy the following properties: $u'(\cdot) > 0$, $u"(\cdot) < 0$; $v'(\cdot) > 0$, $v"(\cdot) \leq 0$. We consider that the household has an insatiable desire for accumulating money;[4] i.e.,

[2]See Blanchard and Fisher (1989) for a discussion of the transaction role of money.

[3]Fershtman et al. (1996), Corneo and Jeanne (1997) and Futagami and Shibata (1998), among others, consider a relative asset holding as a social preference. On the other hand, Zou (1995, 1998), Ono (2001) and Matsuzaki (2003) consider an absolute asset(money) holding. See Weiss and Fershtman (1998) and Clark and Oswald (1998) for an extensive survey on the 'status' literature.

[4]Theoretically, this property obtains in Veblen's framework (1949) where agents care about status. In particular, if $v(m^o)$is replaced by $\mu(m^o - \bar{m}^o)$, where $\bar{m}^o$implies the same generation average of m, $\mu'(m^o - \bar{m}^o)$ stays to be fixed at $\mu'(0)$ as m expands since m^o

$$lim_{m\to\infty} v'(m) = \beta > 0, \tag{2}$$

where β is an exogenous and positive constant value.[5]

Agents are endowed with one unit of labor, which they supply inelastically when young, and they retire when they are old. The agents transfer a given D_t to the government and divide the rest between consumption c_t^y and money holding M_t^y. For clarity of exposition, money is the only asset. Thus, the budget constraints of the young in generation t are: $W_t x_t - D_t = P_t c_t^y + M_t^y$, where W_t, x_t, and P_t denote wage income, the employment rate, and the price index, respectively. Since the population of each generation is normalized to one, employment rate represents $x_t = \min(1,\ n_t)$, where n_t is labor demand. This implies that the realized labor supply is determined on the short side by either the potential labor supply, 1, or by the actual labor demand, n_t, of the firm. The old agents divide their savings, a given government transfer E_{t+1}, and bequests B_{t+1} between consumption c_{t+1}^o and money holding M_{t+1}^o.[6] Then, the budget constraints of the old in generation t are: $M_t^y + E_{t+1} + B_{t+1} = P_{t+1} c_{t+1}^o + M_{t+1}^o$.

Then, the budget constraints valued in real terms are as follows:

$$w_t x_t - d_t = c_t^y + m_t^y, \quad m_t^y/(1+\pi_t) + e_{t+1} + b_{t+1} = c_{t+1}^o + m_{t+1}^o, \tag{3}$$

where $\pi_t (\equiv P_{t+1}/P_t - 1)$ is the inflation rate, and m_t $(= M_t/P_t)$, w_t $(= W_t/P_t)$, and d_t $(= D_t/P_t)$ are valued in real terms.

Maximizing (1) subject to (3), we obtain:

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always equals $\bar{m}^o$ in the present setting. Thus, let this value β, the following argument holds. To consider the policy under stagnation, Ono (2001) and Matsuzaki (2003) use an insatiable preference analogous to our model.

[5]This property is empirically shown by Ono (1994, Ch3), using the General Method of Moment (GMM). Recently, Ono et al. (1998) attempt to provide a justification for the existence of an insatiable liquidity preference by testing for it empirically in Japan, using two data sets (Nikkei Radar data), based on prefectures and individuals. In their empirical investigation, they use two different econometric methods, a parametric and a nonparametric method. They show that an insatiable liquidity preference is significantly positive at standard significance levels.

[6]In this paper, since households have a liquidity preference, the older generation holds money. The property left behind after the older generation has died is transferred to the next generation as an inheritance.

$$1 - \frac{1}{1+\pi_t}\frac{\delta u'(c^o_{t+1})}{u'(c^y_t)} = \frac{v'(m^y_t)}{u'(c^y_t)}, \tag{4}$$

$$u'(c^o_{t+1}) = v'(m^o_{t+1}), \tag{5}$$

where (4) represents Keynes's rule. The left hand side of the equation represents the time preference rate, which is the marginal rate of substitution between consumption by the young and consumption by the old. The right hand side represents the liquidity premium, which is the marginal rate of substitution between present consumption and present money holdings.

2.2 Firms

The production function is assumed to satisfy constant returns to scale: $y_t = \theta n_t$, where y_t represents output. The productivity, θ, is assumed to be constant. Since, in this case, the firm's profits are $n_t(P_t\theta - W_t)$, the real wage rate is given by: $W_t/P_t = w_t = \theta$ in a competitive market.

3 Market Adjustments

Social security can be operated as a pay-as-you-go system, which transfers current contributions made by the young directly to the current old generation, so that: $d_t = e_t$. Moreover, an inheritance is an asset that a former generation's old agents have left to the current generation. Therefore, $b_{t+1} = m^o_t/(1+\pi_t)$.

The money market is assumed to be always in equilibrium. That is,

$$m^y_t + m^o_t = \bar{M}\Big/P_t, \tag{6}$$

where $\bar{M}$ represents the total money supply.

Since the commodity market adjustment is also assumed to be perfect,

$$c^y_t + c^o_t = \theta x_t \tag{7}$$

Then, from (3) and (7), we find that $m^y_t = c^o_t - e_t$ holds in equilibrium.

In contrast, the nominal wage takes time to adjust. Hence, we assume a sluggish nominal-wage adjustment in the labor market. As in Ploeg (1993)

and Ono (2001), we assume the following nominal wage-rate adjustment process:[7]

$$\frac{W_{t+1} - W_t}{W_t} = \alpha(x_t - 1), \tag{8}$$

where α represents the speed of the nominal wage adjustment.

Since the real wage is constant, P moves in parallel to W. Thus, (7) and (8) generate the dynamics of P: $\pi_t \,(\equiv (P_{t+1} - P_t)/P_t) = \alpha[(c_t^y + c_t^o)/\theta - 1]$.

Then, (4) can be rewritten as:

$$1 - \frac{1}{1 + \alpha[(c_t^y + c_t^o)/\theta - 1]} \frac{\delta u'(c_{t+1}^o)}{u'(c_t^y)} = \frac{v'(m_t^y)}{u'(c_t^y)}. \tag{9}$$

4 Stagnation Steady State Conditions and the Effects of Social Security

For expositional purposes, we define the utility function of households as:

$$u(c) = \ln c, \quad v(m) = \ln m + \beta m.$$

4.1 Stagnation steady state conditions

In this section, we present the steady state conditions required to be in stagnation. In the stagnation steady state, c^y and c^o remain constant. Since $x < 1$ in this state and P continues to decline,[8] the proportion of old agents holding money increases.[9] Then, from (5), the old generation's consumption increases. However, under the insatiable liquidity preference equation (2), the marginal liquidity preference approaches its lower bound as P declines. Eventually, the steady state consumption of the old agents becomes:

$$c^o = 1/\beta. \tag{10}$$

From (3), (7) and (10), the proportion of young agents holding money is $m^y = 1/\beta - e$ in market equilibrium. Then, the consumption of the young is

[7] See Roberts (1995) for discussion on various models of such sluggishness price/wage adjustment, called new Keynesian Phillips curve.

[8] See Appendix B for the dynamic stability.

[9] See Appendix A for the dynamics of money holding.

obtained from (9). Now, by defining the π-curve as the time preference rate and the ℓ-curve as the liquidity premium of money, (9) can be expressed as the following two equations:

$$\pi - curve : F(c^y) = 1 - \frac{\delta\beta c^y}{1 + \alpha[(c^y + 1/\beta)/\theta - 1]}, \tag{11}$$

$$\ell - curve : G(c^y) = \left(\frac{1}{1/\beta - e} + \beta\right) c^y, \tag{12}$$

where we assume parameter condition $e < 1/\beta$. Consider the following condition:

$$\alpha < \theta/(\theta - 1/\beta) \tag{13}$$

we assume that this parameter condition holds, then π-curve is decreasing in c^y.[10] These curves are illustrated in Fig. 1. The interaction point of the two curves represents the consumption of the young in a steady state. Since θ is the full employment production level (x=1), full employment is attained when the consumption level of the young equals Y ($\equiv \theta - 1/\beta > 0$). Therefore, from (11) and (12), the stagnation steady state exists if:[11]

$$[1/(1/\beta - e) + \beta]Y > 1 - \delta\beta Y. \tag{14}$$

Equation (14) shows that if β or θ is high, then the economy falls into persistent stagnation.[12]

4.2 The effects of social security

In this section, the effects of an intergenerational redistribution policy on effective demand under stagnation are investigated.

Now, the effect of the social security policy on effective demand can be explained using a π-curve and ℓ-curve of Fig. 1. The π-curve is not influ-

[10] This condition is also needed for ensuring the dynamic stability condition proved in Appendix B.

[11] From (11) and (12), $F(c^y)$ is monotonically decreasing and $G(c^y)$ is monotonically increasing. Since $F(0) > G(0)$ and $F(Y) < G(Y)$ holds under (14), the interaction point lies in the range of $(0, Y)$ and is unique.

[12] A full employment steady state such as that in a neo-classical economy requires that $[1/(1/\beta - e) + \beta]Y < 1 - \delta\beta Y$.

enced by a change to a social security policy e at all, as is clearly shown in equation (11). However, as e is contained in the ℓ-curve of equation (12), it is influenced by the social security policy. Therefore, in order to investigate the effect of a social security policy on effective demand, it is necessary to determine in which direction the ℓ-curve of Fig. 1 shifts because of a change of e. Differentiating equations (12) from e in order to investigate the shift, gives the following results:

$$dG/de = c^y \Big/ (1/\beta - e)^2 > 0. \tag{15}$$

It is shown that the ℓ-curve surely shifts up by the social security policy. Fig. 2 shows that the shift to the upper part of the ℓ-curve decreases the effective demand to c^{y**} from c^{y*}. This can be explained intuitively as follows. The reduction in the younger generation's money holdings leads to a rise in the liquidity premium, i.e., a shift to the upper part of the ℓ-curve. To fulfill Keynes's rule in stagnation, the level of consumption must be decreased and the consumption rate of time preference, the π-curve, must shift upwards. Therefore, since a rise in the social security costs will reduce the younger generation's money holdings, the liquidity preference increases, with the effect that consumption is cut back. Moreover, the older generation's liquidity premium reaches a lower bound in the steady state because the social security benefits increase the older agents' income, and this extra income goes towards holding money rather than towards consumption. Moreover, from equation (7), it is shown that the reduction in the effective demand worsens the rate of employment.

5 Conclusion

This paper has used a stagnation model to examine the impact of intergenerational transfer on effective demand and the employment rate. In this model, the older generation does not increase consumption because of their insatiable desire for accumulating money, whereas the younger generation cannot consume because they are poor. Consequently, persistent stagnation arises. We found that, although a policy that redistributes income from the younger generation to the older generation, such as social security policy, decreases the consumption by the young, the consumption by the old is not changed. Thus, such a policy worsens the effective demand and, as a result, increases the unemployment rate.

A The dynamics of money holdings

From (3) and (7), $m_t^y = c_t^o - e_t$ holds in equilibrium. Substituting this and (5) into (8) yields:

$$\left(\frac{1}{1/m_t^o + \beta} - e\right) + m_t^o = \frac{\bar{M}}{P_t}. \tag{16}$$

From (16), $dm_t^o/dP_t < 0$ holds. Thus, the older generations' holdings of money continue to increase under the persistent deflation in the stagnation steady state. On the other hand, since the younger generation's holding of money is $m_t^y = \frac{1}{1/m_t^o+\beta} - e$ in equilibrium, the steady state value becomes $m^y = 1/\beta - e$.

B Stability analysis

In this appendix we examine the conditions for stability. We set the transfer e to 0 for simplicity. From (3), (5) and (7), the younger generations' holding of money is c_t^o in equilibrium. In addition, the older generation's holding of money is $m_t^o = \phi(P_t)$ from (16), where $\phi'(P_t) < 0$. Then, from (4) and (5), we obtain:

$$v'\left(\frac{1}{v'(\phi(P_t))}\right) c_t^y - 1 + \frac{1}{1+\pi_t}\delta c_t^y v'(\phi(P_{t+1})) = 0. \tag{17}$$

Thus, the younger generation's consumption is written as $c_t^y = c^y(P_t, P_{t+1})$ from (17). On the other hand, since from (5), the older generation's consumption is $c_t^0 = 1/v'(\phi(P_t))$, the dynamics of P can be rewritten as:

$$\frac{P_{t+1}}{P_t} = 1 + \alpha\left(\frac{c^y(P_t, P_{t+1}) + 1/v'(\phi(P_t))}{\theta} - 1\right). \tag{18}$$

Now, to check the local stability, we evaluate the deliverance of (18) around the stagnation steady state:

$$\frac{dP_{t+1}}{dP_t} = 1 + \alpha\left(\frac{c^y + 1/\beta}{\theta} - 1\right). \tag{19}$$

(19) is satisfied as $0 < dP_{t+1}/dP_t < 1$ under (13) and (14). Thus, the local stability conditions are sufficient for the economy to be stable.

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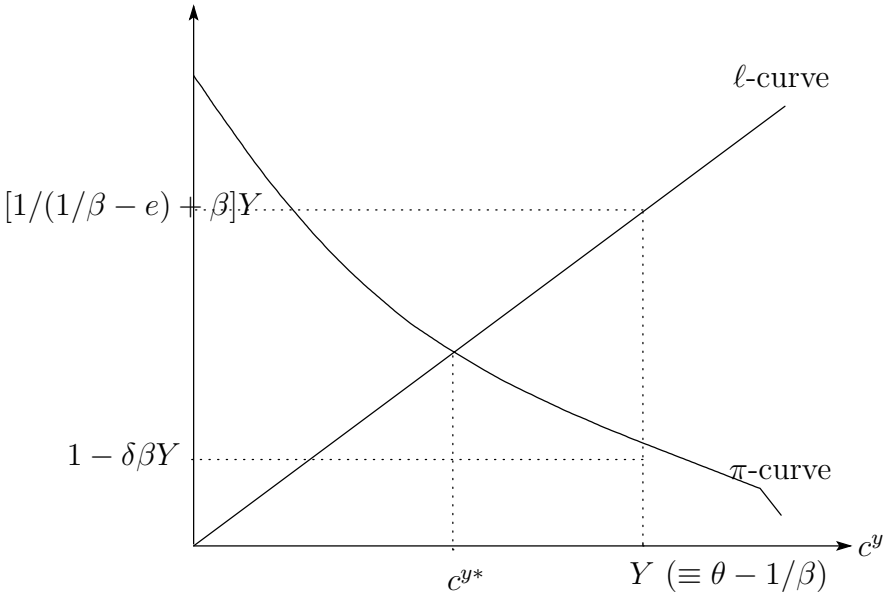

Figure 1: Stagnation Steady State

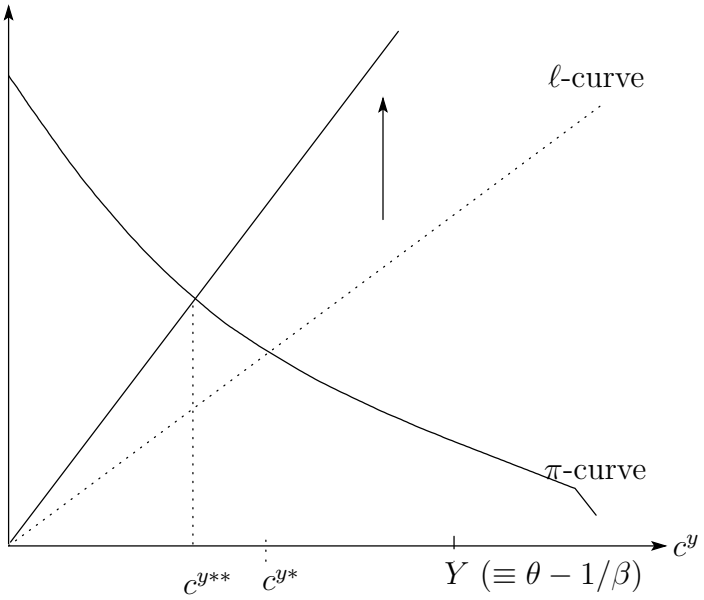

Figure 2: The Effect of Social Security Policy