

Coordination Failure under Perfect Competition

— A Micro Foundation of Keynes-type Consumption Function —

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This paper considers the coordination failure under perfect competition in an overlapping generations model. If the marginal propensity to consume decreases, then the outputs decrease. There is a continuum of Pareto-ranked equilibria with respect to the marginal propensity to consume.

I. Introduction

This paper considers the coordination failure under perfect competition in an overlapping generations model. The coordination failure, commonly, has been studied in the model of imperfect competition (e.g., Hart 1982, Heller 1987, Blanchard and Kiyotaki 1987, Cooper and John 1988)¹⁾. The imperfect competition is regarded as a necessary factor to generate the Pareto rankable multiple equilibria since firms' strategic interactions might be important.

On the other hand, the coordination failure stems from consumer side has not been well studied theoretically so far. This paper focuses on this point. That is, if the marginal propensity to consume decreases, then the outputs decrease. It is shown that these equilibria can be Pareto ranked.

In section 2, we present the model. In section 3, the general equilibrium is derived. The welfare analysis is presented in section 4. We conclude the paper in section 5.

II. The Model

1. Consumer's problem

Consider an overlapping-generations economy. There are a identical consumers in each generation. They live only two periods. Their preferences are defined by

$$(c_1)^r(c_2)^{1-r} - kl_1^e,$$

$$0 < r < 1, k > 0, e \geq 1, \quad (1)$$

where c_1 and c_2 is the consumption when they are young and old respectively, l_1 is the labor supply when they are young. This type of utility function is commonly used in macro models with imperfect competition (see Dixon and Rankin 1994; Cooper 1999). For simplicity, suppose

that $e = 1$ ²⁾

Then, the representative consumer's problem is

$$\begin{aligned} \text{Max}_{c_1, c_2, l_1} \quad & (c_1)^\gamma (c_2)^{1-\gamma} - kl_1 \\ \text{s.t.} \quad & p_1 c_1 + m_1 = w_1 l_1 + r_1, \\ & p_2^e c_2 = m_1, \\ \text{where } r_1 \equiv & \frac{1}{a} \sum_{i=1}^n \pi_i. \end{aligned} \quad (2)$$

From (2), the individual demand function in which the income is regarded as given can be derived to

$$\begin{aligned} c_1(p_1, I_1) &= \frac{\gamma I_1}{p_1}, \\ c_2(p_2^e, I_1) &= \frac{(1-\gamma)I_1}{p_2^e}, \end{aligned}$$

where $I_1 \equiv w_1 l_1 + r_1$.

Substituting the demand function into the utility function (1), we obtain the following form:

$$v(l_1) = \Gamma \left(\frac{p_1}{p_2^e} \right)^{1-\gamma} \frac{(w_1 l_1 + r_1)}{p_1} - kl_1, \quad (3)$$

where $\Gamma \equiv \gamma^\gamma (1-\gamma)^{1-\gamma}$. Hence, the optimal condition for labor supply is

$$\frac{w_1}{p_1} = \frac{k}{\Gamma (p_1/p_2^e)^{1-\gamma}}. \quad (4)$$

2. Effective demand

Since there are a consumers in each generation, the consumption demands of generation t are the following:

$$\begin{aligned} C_1^t(p_1, I_t) &= a \left(\frac{\gamma I_t}{p_1} \right), \\ C_2^t(p_2, I_t) &= a \left(\frac{(1-\gamma)I_t}{p_2^e} \right). \end{aligned}$$

Thus, the market demand function of period t becomes

$$\begin{aligned} C_t &= C_1^t(p_t, I_t) + C_2^{t-1}(p_t, I_{t-1}) \\ &= \frac{a}{p_t} [\gamma I_t + (1-\gamma)I_{t-1}]. \end{aligned} \quad (5)$$

Imposing the equilibrium condition of labor market, i.e., $alt = nL_t$, into I_t , and from the definition of r_t , the following Income-Expenditure identity is held in equilibrium:

$$aI_t^* = np_t p_t^*. \quad (6)$$

Substituting (6) into (5), we obtain the effective demand, or Keynes-type consumption function:

$$C_t^* = n \left[\gamma q_t^* + (1-\gamma) \frac{p_t - 1}{p_t} \cdot q_{t-1}^* \right]. \quad (7)$$

From (7), it is found that γ represents the marginal propensity to consume, since the real income at period t is nq_t^* from (6). The second term can be regarded as the basic consumption at period t .

3. Firm's problem

There are n identical firms. The production function in period t is given by

$$q_t = \alpha L_t^\beta, \quad \alpha > 0, 0 < \beta < 1. \quad (8)$$

From the price-taking assumption and no capital, the firm's problem is reduced to the each period's profit maximization. Thus, the optimal labor demand at period t can be derived to

$$L_t^d = \left(\frac{w_t}{\alpha \beta p_t} \right)^{-\frac{1}{1-\beta}}. \quad (9)$$

III. Market Equilibrium

Assume that consumers have perfect foresight; i.e., $p_{t+1}^e = p_{t+1}$. Substituting (4) into (9), and from (8), we obtain the equilibrium supply of representative firm with labor market clearing:

$$q_t^* = \alpha \left(\frac{\alpha \beta \Gamma \theta_t^{1-\gamma}}{k} \right)^{\frac{\beta}{1-\beta}}, \quad (10)$$

where $\theta_t = p_t/p_{t+1}$.

Imposing the equilibrium condition of commodity market, i.e., $C_t^* = nq_t^*$, into (7) yields,

$$q_t^* = \theta_{t-1} q_{t-1}^*. \quad (11)$$

Substituting (10) into (11), we obtain,

$$\theta_t = (\theta_{t-1})^{\frac{1-\beta\gamma}{\beta(1-\gamma)}}. \quad (12)$$

Under the perfect foresight assumption, the unique stationary equilibrium with money³⁾ is $\theta^* = 1$. From (10) and (12), it is found that the equilibrium relative price does not change while equilibrium outputs change with respect to γ .

Therefore, the following proposition is established.

PROPOSITION 1. *There is a continuum of stationary state with respect to γ .*

$$q^*(\Gamma) = \alpha \left(\frac{\alpha \beta \Gamma}{k} \right)^{\frac{\beta}{1-\beta}}. \quad (13)$$

and if $\gamma \in (0.5, 1)$,

$$\frac{dq^*(\Gamma)}{d\gamma} > 0. \quad (14)$$

An example of Proposition 1 appears in Figure 1. That is the case when the marginal propensity to consume decreases. Notice that the consumption of old generation plays the role of basic consumption as in Keynes-type consumption function (7), that is, the intercept of vertical axis. Hence, the decrease of the marginal propensity to consume implies not only the decrease of consumption of young, but also the increase of consumption of old generation⁴⁾. Proposition 1 shows that the effects of former dominates that of latter if $\gamma \in (0.5, 1)$.

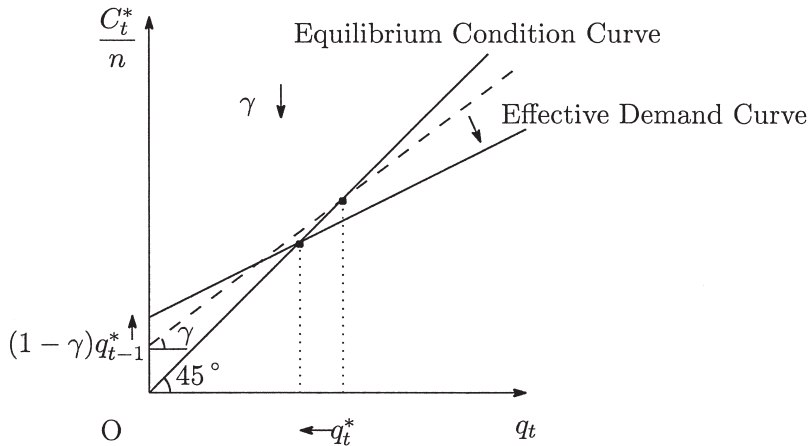


Figure 1 : If the marginal propensity to consume decreases, then the equilibrium outputs decrease.

IV. Welfare analysis

From (13), (6), and (3), the welfare function with respect to Γ can be derived to

$$W(\Gamma) = n(\beta^{-1} - 1)(\alpha\beta\kappa^{-\beta}\Gamma)^{\frac{1}{1-\beta}}. \quad (15)$$

PROPOSITION 2. *From assumptions $\alpha > 0$ and $0 < \beta < 1$, if $\gamma \in (0.5, 1)$,*

$$\frac{dW(\Gamma)}{d\gamma} > 0. \quad (16)$$

From the above discussions, we can establish the following proposition.

PROPOSITION 3. *From Proposition 1 and Proposition 2, there is a continuum of Pareto-ranked equilibria with respect to the marginal propensity to consume.*

V. Conclusion

We have presented a micro foundation of Keynesian features, especially the Keynes-type consumption function that is regarded as there is no micro-foundation so far, in a simple macro economic model. It is found that a coordination failure can emerge even under perfect competition. In other words, imperfect competition is not necessary for it.

Next, the consumption function (7) is similar to that of Friedman's Permanent Income Hypothesis and Modigliani's Life Cycle Hypothesis. However, the implication is much different. That is, the above two hypotheses insist that consumers tend to equalize their consumption in

each period. To the contrary, this model predicts that the large consumption of young is better for welfare. This is the so-called "paradox of thrift".

Finally, notice that the equilibrium is uniquely determined if γ is fixed. Changes in γ , however, represents the changes in mind or market psychology. It is natural to consider it as a driving force of business cycles. Notice also that although the labor market is underemployment, it might be more important for Keynesian features that these equilibria are Pareto-ranked. Furthermore, the involuntary unemployment could be investigated by introducing a rationing rule into the labor market. In addition to that, introducing government or capital is a natural extension. These are for future research.

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- 1) See Dixon and Rankin (1994) and Cooper (1999) for comprehensive discussion.
- 2) The main property does not change even if $e > 1$.
- 3) As in the standard OLG model, outside money is endowed to the generation zero. We have omitted the description of it for the sake of brevity.
- 4) If we focus on the period that γ is just changed, the intercept does not change at that period because it is historically determined.

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