# A Note on Dutt and Sen's(1997) Microfoundation for the Kalecki Model

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**Abstract**

Dutt and Sen (1997) constructed a monopolistic competition model with union bargaining to provide a rigorous microfoundation for the Kalecki model. They demonstrated that a change in the money stock impacts real variables, such as output, when the nominal level of the worker's reservation wage is exogenously given. We demonstrate, however, that when its real level is given, the neutrality of money revives, which means that the main feature of the Keynes–Kalecki model no longer holds true.

**Keywords**: monopolistic competition, labor union, neutrality of money, Kalecki, microfoundation

**JEL Classification**: E1, J5

## 1. Introduction

The Kalecki (1971) model is one of the most basic models in the area of post-Keynesian economics. In this area, however, the standard neoclassical method of modeling, namely, Walrasian general equilibrium modeling with agents' optimizing behaviors, has not been highly regarded; thus, most models used in this area lack the microfoundation. Constructing a monopolistically competitive general equilibrium model with union bargaining, Dutt and Sen (1997) (hereafter, DS (1997)) provided a rigorous optimizing microfoundation for the Kalecki model. Their study is interesting and worth focusing on because few studies have attempted to refine the Kalecki model in such a Walrasian manner.

This note aims to re-examine the robustness of their microfoundation. They supposed that the worker's reservation wage in the bargaining process equals the unemployment benefit and that its nominal level is exogenously given. Under such an assumption, they

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demonstrated that a change in the nominal money stock impacts the real variables, such as output (i.e., money is not neutral). This is one of the most fundamental features in models of the Keynes–Kalecki type. In this note, however, when the real level of the unemployment benefit is exogenously given, the neutrality of money revives, which means that the model has not Keynesian but neoclassical features. This result reveals that the microfoundation by DS (1997) is effective in the relatively short run, where the nominal level of unemployment benefit is fixed regardless of a change in the price level, but is not necessarily persuasive in the relatively long run, where its nominal level is flexibly adjusted to the price level to keep its real value constant.

## 2. Model and Result

We consider a slightly simplified version of DS (1997)'s static monopolistic competition model with $n$ types of differentiated consumption goods[2]. ($n$ is also the number of firms because the good $i$ ($i=1,2,\cdots,n$) is produced monopolistically by the firm $i$.)

In the household sector, there are $N(>n)$ individuals belonging to the working class who have no initial wealth and supply one unit of labor inelastically and a capitalist who does not work and is endowed with the initial money stock and the equities of all firms.

In the labor market, the nominal wage $W$ and the employment $N_1(<N)$ are determined through bargaining between firms and labor unions; accordingly, $N_1$ individuals are employed while $N-N_1$ individuals are not employed and receive the unemployment benefit $W_u$. We use the subscript $j$ to denote the status of each individual: $j=1$ denotes an employed worker, $j=2$ denotes an unemployed worker, and $j=3$ denotes the capitalist.

The utility maximization problem of individual $j$ can be formulated as

$$(1)\qquad \max_{c_{ij},M_j^d} \quad U_j=(C_j)^{\Theta}(M_j^d/P)^{1-\Theta} \qquad (0<\Theta<1)$$

$$\text{s.t.}\quad \sum_{i=1}^{n} p_i c_{ij}+M_j^d=I_j, \quad C_j\equiv\left[\sum_{i=1}^{n}(c_{ij})^{(E-1)/E}\right]^{E/(E-1)},$$

where $c_{ij}$ denotes $j$'s consumption of the good $i$, $C_j$ denotes $j$'s sub-utility,

[2] DS (1997) considers the government spending and the firm's investment demand and loans. They are abstracted in our model because introducing them does not change our result.

$E(>1)$ denotes the elasticity of substitution between goods, $p_i$ denotes the nominal price of good $i$, $P$ denotes the aggregate price index defined below, and $M_j^d$ denotes $j$'s nominal money demand. $I_j$ denotes $j$'s nominal income represented as

$$(2) \qquad I_1 = W, \quad I_2 = W_u, \quad I_3 = \sum_{i=1}^{n} \Pi_i + M - T,$$

where $\Pi_i$ denotes the firm $i$'s nominal profit, $M$ denotes the initial money stock, and $T$ denotes the lump-sum tax levied only on the capitalist.

Solving (1), we have

$$(3) \qquad c_{ij} = \left(\frac{p_i}{P}\right)^{-E} C_j \qquad \left(P \equiv \left[\sum_{i=1}^{n} (p_i)^{1-E}\right]^{1/(1-E)}\right),$$

$$(4) \qquad C_j = \frac{\sum_{i=1}^{n} p_i c_{ij}}{P},$$

$$(5) \qquad C_1 = \frac{\Theta W}{P}, \quad C_2 = \frac{\Theta W_u}{P}, \quad C_3 = \frac{\Theta}{P}\left(\sum_{i=1}^{n} \Pi_i + M - T\right).$$

Equation (3) is $j$'s demand function for each differentiated good[3]. From (4), $j$'s sub-utility can be interpreted as real expenditure; its utility-maximizing level for each $j$ is given by (5). From (3) and (5), the total demand for good $i$ can be calculated as

$$(6) \quad y_i^d = c_{i1} N_1 + c_{i2}(N - N_1) + c_{i3} = \left(\frac{p_i}{P}\right)^{-E} C \qquad (C \equiv C_1 N_1 + C_2 (N - N_1) + C_3).$$

Since the budget constraint of the government is

$$(7) \qquad W_u (N - N_1) = T,$$

the aggregated real expenditure $C$ can be calculated from (5) and (7) as

$$(8) \qquad C = \frac{\Theta}{P}\left(W N_1 + \sum_{i=1}^{n} \Pi_i + M\right).$$

The formulation of the production sector is basically the same as that by DS (1997). The production function and the nominal profit of firm $i$ are, respectively,

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[3] DS (1997) derived the price index as $P = \left[\sum_{i=1}^{n} (p_i)^{1-E} / n\right]^{1/(1-E)}$, but it is not correct.

(9) $y_i = (l_i)^{1/\alpha} \quad ((E-1)/E < \alpha < \infty)$[4],

(10) $\Pi_i = p_i y_i - W l_i$.

$N$ individuals in the working class are divided into $n$ parts, and each group (with $\mu \equiv N/n$ members) forms a labor union. The firm $i$ ($i = 1,2,\cdots,n$) negotiates both the nominal wage $W$ and the nominal price $p_i$ of good $i$ (or, equivalently, firm $i$'s employment $l_i$) with a labor union (i.e., the efficient bargaining model is considered). A labor union aims to maximize the expected income $V_i$ of its workers:

$$V_i = \frac{l_i}{\mu} \times W + \left(1 - \frac{l_i}{\mu}\right) \times W_u .$$

The negotiation aims to maximize the following Nash product $Z_i$:

$$Z_i = (\Pi_i - \Pi_i^0)^b (V_i - V_i^0)^{1-b} \quad (0 < b < 1),$$

where $\Pi_i$ denotes firm $i$'s nominal profit, $\Pi_i^0$ denotes its reservation profit such that $\Pi_i^0 = 0$, $V_i^0$ denotes the worker's reservation wage that is supposed to equal the unemployment benefit ($V_i^0 = W_u$), and $b$ denotes firm $i$'s negotiation power. Thus, the bargaining problem can be formulated as

(11) $$\max_{W, p_i} \quad Z_i = (\Pi_i)^b \left[\frac{l_i}{\mu}(W - W_u)\right]^{1-b} \qquad \text{s.t.} \quad (6), \quad (9), \quad (10).$$

Solving this, we have

(12) $$W = \frac{\alpha E(1-b) + (E-1)b}{E-1} W_u ,$$

(13) $$p = n^{(1-\alpha)E/(E-1)} \frac{\alpha E}{E-1} W_u C^{\alpha - 1}, \quad P = n^{-1/(E-1)} p .$$

Finally, we derive the macroeconomic equilibrium by deriving AS and AD curves. From (6) and (13), the output of each firm is

(14) $$y = n^{E/(E-1)} C .$$

Substituting this into the first equation of (13), we have an upward-sloping AS curve, which determines the price level given the firm's output:

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[4] DS (1997) examined only the case of $1 \le \alpha < \infty$ (decreasing and constant returns to scale); however, including the range of $(E-1)/E < \alpha < 1$ (increasing return to scale) does not alter our result.

$$P = n^{-1/(E-1)} \frac{\alpha E}{E-1} W_u y^{-(1-\alpha)} . \tag{15}$$

On the other hand, using the fact $npy = WN_1 + \sum_{i=1}^{n} \Pi_i$, the aggregated real expenditure (8) can be rewritten as

$$C = \Theta(npy + M)/P . \tag{16}$$

From (14) and (16), we can derive a downward-sloping AD curve, which determines the firm's output given the aggregated real expenditure:

$$n^{E/(E-1)} y = \frac{\Theta M}{(1-\Theta)P} . \tag{17}$$

From (15) and (17), the firm's output and price level in equilibrium are

$$y = \left( \frac{\Theta(E-1)M}{(1-\Theta)E\alpha n W_u} \right)^{1/\alpha}, \quad P = n^{-1/(E-1)} \left( \frac{\Theta M}{(1-\Theta)n} \right)^{(\alpha-1)/\alpha} \left( \frac{\alpha E W_u}{E-1} \right)^{1/\alpha} . \tag{18}$$

Note that both $y$ and $P$ do not depend on the firm's negotiation power $b$ because the consumption propensities of the worker and capitalist are assumed to be equal in our model.

From (18), when the nominal unemployment benefit $W_u$ is exogenously given, which is the case studied by DS (1997), a change in the money stock $M$ shifts the AD curve shown by (17) and impacts the equilibrium output and price (i.e., money is not neutral). This is the main feature of the Keynes–Kalecki model. The reason why this result holds true is that in the case where $W_u$ is exogenously fixed the nominal wage $W$ is also fixed by (12) and accordingly the model exhibits the features of the non-Walrasian fixed price model.

How does the result change in the case where the real (not the nominal) level of $W_u$ is given as below?

$W_u / P = \beta$ ($\beta$ : a given constant)

In this case, we can easily confirm from (18) that the neutrality of money revives and the model no longer exhibits Keynes–Kalecki features.

## Result

When the nominal level of the worker's reservation wage (or, equivalently, the unemployment benefit) is given, the neutrality of money does not hold; however, when its real level is given, the neutrality of money revives.

This result implies that the microfoundation built by DS (1997) is effective in the relatively short run, where the nominal level of unemployment benefit is fixed regardless of the change in the price level; however, it is not necessarily persuasive in the relatively long run, where its nominal level is flexibly adjusted to the price level to keep its real value constant.

Finally, we make several remarks on the robustness of our result. First, we have assumed that the consumption propensity of the worker equals that of the capitalist; however, assuming that they are not equal does not alter the result. Second, we have supposed the efficient bargaining model in which both the wage and employment are determined through bargaining; however, the result remains unchanged even if we suppose the right to manage model in which only the wage is determined through negotiation. Finally, extending DS (1997) to a dual labor market model in which the nominal wage in the primary sector is determined through negotiation and that in the secondary sector is determined competitively, Tanaka (2016) showed that the neutrality of money holds true when the worker's nominal reservation wage is linked to the nominal wage in the secondary sector. This implies that the neutrality of money holds true when the nominal reservation wage is linked to the nominal endogenous variables. These facts reveal that our result has a considerable degree of robustness.

## References

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