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Financialization and Distribution in a Kaleckian Model with Firms' Debt Accumulation

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Abstract

This study investigates the degree to which increased shareholder power, which is important in the context of financialization, affects macroeconomic variables, exclusively income distribution, by building a Kaleckian model with firms' debt accumulation. We find that the extent to which a decrease in firms' retention ratio affects rentiers' and workers' income distribution differs according to whether the steady-state equilibrium exhibits debt-led or debt-burdened demand.

Keywords: financialization; income distribution; firm debt

JEL Classification: E12, E21, E22, E32, E44

1 Introduction

This study investigates how increased shareholder power, which is important in the context of financialization,[1)] affects macroeconomic variables, exclusively income distribution, by building a Kaleckian model with firms' debt accumulation. While many studies adopt Kaleckian models with debt accumulation (Lavoie, 1995; Hein, 2006, 2007; Asada, 2006; Nishi, 2012; Sasaki and Fujita, 2012, 2014a, 2014b), few endogenize income distribution.[2)]

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1) Financialization entails the appearance of new financial commodities along with the deregulation of the financial market; an increase in financial transactions, including financial investment by firms and credit-financed consumption by households; and the restructuring of corporate governance to favor shareholder value. In particular, many studies acknowledge the redistribution of income in favor of shareholders. Skott and Ryoo (2008), Van Treeck (2008), and Dallery (2009) show empirically that under financialization, dividend payments to shareholders increase and firms' retention ratio decreases

2) Sasaki (2016) builds a Kaleckian model that endogenizes the capacity utilization rate, profit share, employment rate, and debt/capital ratio to investigate the effects of the retention ratio and interest rate on the economy. In the short run, the capacity utilization rate and profit share change, while the employment rate and debt/capital ratio change in the long run.

Income distribution in the present paper means that between rentiers and workers. The Kaleckian model is thus suitable for analyzing the effect of income distribution on output and economic growth (Marglin and Bhaduri, 1990), as it emphasizes income distribution, making it appropriate in the context of financialization. Accordingly, this study constructs a Kaleckian model in which the capacity utilization rate, profit share, and debt/capital ratio are endogenously determined to examine the stability and property of the steady-state equilibrium. Specifically, we investigate under what conditions the steady-state equilibrium is stable and how rentiers' income share and workers' income share change when firms' retention ratio and the interest rate change.

Hein (2007) and Sasaki and Fujita (2012) are closely related to the present study. Hein (2007) investigates the extent to which an increase in the debt/capital ratio (an exogenous variable) changes the capital accumulation rate in the short run. Then, he defines a debt-led and a debt-burdened economy, finding that in the former (latter) economy, an increase in the debt/capital ratio increases (decreases) the capital accumulation rate. He finally shows that the long-run equilibrium is stable (unstable) when the short-run equilibrium exhibits debt-led (debt-burdened) growth.

However, Hein's (2007) results could be improved. First, although the author shows that the long-run equilibrium is stable only when the short-run equilibrium exhibits debt-led growth and it is necessarily unstable when the short-run equilibrium exhibits debt-burdened growth, the real economy may be debt-led or debt-burdened. Indeed, if the real economy is debt-burdened, it is hard to think that the debt/capital ratio explodes to infinity or converges to zero. Moreover, even a debt-burdened economy may be stable.

Second, Hein (2007) assumes that the retention ratio of firms is equal to unity, that is, the dividend payout ratio is equal to zero. However, as Sasaki and Fujita (2012) point out, the main results of Hein (2007) rely on this assumption. Sasaki and Fujita (2012) show that if the retention ratio is less than unity, we can build a more realistic model qualitatively and quantitatively.[3)] For instance, if the retention ratio is less than unity, the long-run equilibrium can be stable even if the short-run equilibrium exhibits debt-burdened growth.

However, even in Sasaki and Fujita (2012), the profit share is given exogenously. To examine the effect of financialization on income distribution, we thus need a model that endogenizes income distribution. The present study attempts to bridge this gap in the literature.

The remainder of the paper is organized as follows. Section 2 presents our model. Section 3 investigates the stability of the steady-state equilibrium. Section 4 conducts the nu-

3) Hein (2013) is a rejoinder to Sasaki and Fujita (2012). Franke (2016), admitting the validity of Sasaki and Fujita (2012), extends Hein (2013).

merical simulations. Section 5 concludes the paper.

2 The Model

Suppose a closed economy in which workers, rentiers, firms, and the central bank exist. Workers obtain wage income by working. Rentiers supply capital stock to firms and obtain interest income and dividend income. Firms conduct production activity and finance the funds needed for investment by retaining earnings, borrowing, and issuing shares. The central bank sets the nominal interest rate level. Only one good is produced and used for both consumption and investment. The goods market is oligopolistic, and firms are price setters.

We assume the following Leontief production function:

$$Y = \min\{aE, uK\}, \tag{1}$$

where Y denotes output; E, employment; and K, capital stock. Firms conduct cost-minimizing behavior and choose the combination of E and K such that $aE = uK$. Then, $a = Y/E$ denotes labor productivity and $u = Y/K$, the output/capital ratio. Suppose that the potential output/capital ratio (i.e., technical capital productivity) is constant. Then, u can be regarded as the capacity utilization rate.

We assume that the ex-ante firms' equipment investment function is increasing in firms' retained earnings:

$$g^d = g^d(u, m, i\ell) = \alpha + \beta s_f(um - i\ell), \quad \alpha > 0,\ 0 < \beta < 1, \tag{2}$$

where g^d denotes equipment investment normalized by capital stock; m, the profit share; i, the nominal interest rate; $\ell = L/(pK)$, the debt/capital ratio; L, firms' nominal debt; and p, the price of goods. The parameter α shows the animal spirits of entrepreneurs. The parameter β shows the impact of equipment investment with respect to the retention ratio. We assume that $0 < \beta < 1$, which implies that the impact is not so large.

We assume that workers consume all wage income and thus do not save, rentiers save dividend and interest income at a constant rate s_c, and firms save the remaining profits minus interest payments at a constant rate s_f. That is, s_f denotes the retention rate, which is a key parameter in our investigation. Therefore, total saving in the economy normalized by capital stock leads to

$$g^s = g^s(u, m, i\ell) = s_f(um - i\ell) + s_c[(1 - s_f)(um - i\ell) + i\ell], \quad 0 < s_f < 1,\ 0 < s_c < 1. \tag{3}$$

In the goods market, quantity adjustments work:

$$\dot{u} = \phi(g^d - g^s), \quad \phi > 0, \tag{4}$$

where ϕ denotes the adjustment speed of the goods market. When there is excess demand (supply) in the goods market, the capacity utilization rate increases (decreases). By substituting the investment function (2) and saving function (3) into equation (4), we obtain the differential equation of the capacity utilization rate.

By differentiating the definition of the profit share $m = 1 - [(w/p)/a]$ with respect to time, we obtain the following relationship:

$$\frac{\dot{m}}{1-m} = \frac{\dot{p}}{p} - \frac{\dot{w}}{w} + \frac{\dot{a}}{a}. \tag{5}$$

That is, a change in the profit share is decomposed into the rate of change in the price of goods, that in the nominal wage, and that in labor productivity.

We specify the rate of change of the nominal wage and that of the price of goods based on the theory of conflict inflation. We assume that the rate of change of the nominal wage changes in response to the gap between the actual profit share and target profit share set by labor unions. We assume that the price of goods changes in response to the gap between the target profit share set by firms and the actual profit share:

$$\frac{\dot{w}}{w} = \theta_w(m - m_w), \quad m_w = m_w(u),\ m_w' < 0, \tag{6}$$

$$\frac{\dot{p}}{p} = \theta_f(m_f - m), \quad m_f = m_f(i\ell),\ m_f' > 0, \tag{7}$$

where w denotes the nominal wage; m_w, the target profit share of labor unions; and m_f, the target profit share of firms. The derivative $m_w' < 0$ shows the reserve army effect and the derivative $m_f' > 0$ shows the interest burden price pass (IBPP) effect. If Okun's law holds, that is, if there is a one-to-one relationship between the capacity utilization rate and employment rate, then an increase in the capacity utilization rate (employment rate) strengthens the bargaining power of labor unions, which places upward pressure on the real wage, leading to a decline in the profit share (reserve army effect). An increase in the interest burden of firms places downward pressure on the profit of firms, and so, to offset the decline in profit, firms increase their target profit share (IBPP effect).

The growth rate of labor productivity is given by

$$\frac{\dot{a}}{a} = g_a(u), \quad g_a' > 0. \tag{8}$$

The derivative $g_a' > 0$ shows the reserve army creation effect. An increase in the capacity utilization rate (i.e., the employment rate) leads to a rise in the real wage rate, and so, firms intend to adopt labor-saving technology to save costs. Accordingly, the growth rate of labor productivity is an increasing function of the capacity utilization rate (reserve army creation effect).

By substituting equations (6)–(8) into equation (5), we obtain the differential equation of the profit share.

The rate of change in the debt/capital ratio $\ell = L/(pK)$ is given by

$$\frac{\dot{\ell}}{\ell} = \frac{\dot{L}}{L} - g - \frac{\dot{p}}{p}, \tag{9}$$

where g denotes the capital accumulation rate.

We specify a change in the nominal debt of firms as follows:

$$\begin{aligned} \dot{L} &= pI - s_f(rpK - iL) \\ &= pI - s_f(um - i\ell)pK. \end{aligned} \tag{10}$$

That is, firms finance investment expenditure firstly by retained earnings and then by debt. Then, the rate of change of nominal debt is given by

$$\frac{\dot{L}}{L} = \frac{1}{\ell}[g - s_f(um - i\ell)]. \tag{11}$$

By substituting equation (7) and (11) into into equation on the rate of change of the debt/capital ratio (9), we obtain the differential equation of ℓ.

By summarizing the above results, we obtain the system of differential equations as follows:

$$\dot{u} = \phi[g^d(u, m, i\ell) - g^s(u, m, i\ell)], \tag{12}$$

$$\dot{m} = (1 - m)\{\theta_f[m_f(i\ell) - m] - \theta_w[m - m_w(u)] + g_a(u)\}, \tag{13}$$

$$\dot{\ell} = g^d(u, m, i\ell) - s_f(um - i\ell) - g^d(u, m, i\ell)\ell - \theta_f[m_f(i\ell) - m]\ell. \tag{14}$$

This is a system of differential equations with respect to u, m, and ℓ.

3 Steady state and stability analysis

The steady state is a situation in which $\dot{u} = \dot{m} = \dot{\ell} = 0$. Let u^*, m^*, and ℓ^* denote the steady-state values. Then, these values satisfy the following equations:

$$\alpha + [\beta s_f - s_c - (1 - s_c)s_f](u^* m^* - i\ell^*) - s_c i\ell^* = 0, \tag{15}$$

$$\theta_f[m_f(i\ell^*) - m^*] - \theta_w[m^* - m_w(u^*)] + g_a(u^*) = 0, \tag{16}$$

$$(1 - \ell^*)[\alpha + \beta s_f(u^* m^* - i\ell^*)] - s_f(u^* m^* - i\ell^*) - \theta_f[m_f(i\ell^*) - m^*]\ell^* = 0. \tag{17}$$

Below, we assume that there exist $u^* \in (0, 1)$, $m^* \in (0, 1)$, and $\ell^* \in (0, 1)$ that simultaneously satisfy the above three equations.[4)]

Each element of the Jacobian matrix $\mathbf{J}$ corresponding to our dynamical system is given as follows:

$$J_{11} = \frac{\partial \dot{u}}{\partial u} = -\phi[s_c + (1 - s_c - \beta)s_f]m, \tag{18}$$

$$J_{12} = \frac{\partial \dot{u}}{\partial m} = -\phi[s_c + (1 - s_c - \beta)s_f]u, \tag{19}$$

$$J_{13} = \frac{\partial \dot{u}}{\partial \ell} = \phi s_f i(1 - s_c - \beta), \tag{20}$$

$$J_{21} = \frac{\partial \dot{m}}{\partial u} = (1 - m)[\theta_w m_w'(u) + g_a'(u)] = (1 - m)\Gamma(u; \theta_w), \tag{21}$$

$$J_{22} = \frac{\partial \dot{m}}{\partial m} = -(\theta_f + \theta_w)(1 - m), \tag{22}$$

$$J_{23} = \frac{\partial \dot{m}}{\partial \ell} = \theta_f i(1 - m)m_f'(i\ell), \tag{23}$$

$$J_{31} = \frac{\partial \dot{\ell}}{\partial u} = -s_f(1 - \beta + \beta\ell)m, \tag{24}$$

$$J_{32} = \frac{\partial \dot{\ell}}{\partial m} = -s_f(1 - \beta + \beta\ell)u + \theta_f\ell, \tag{25}$$

$$J_{33} = \frac{\partial \dot{\ell}}{\partial \ell} = s_f i(1 - \beta + \beta\ell) - \theta_f i\ell m_f'(i\ell) - \frac{s_c[(1 - s_f)um + s_f i\ell]}{\ell}. \tag{26}$$

All elements are evaluated at the steady state equilibrium values though asterisks are omitted for ease of exposition. In what follows, we examine the sign of each element.

J_{11} shows the own effect of an increase in the capacity utilization rate on the capacity utilization rate. We introduce the following assumption.

Assumption 1. *The following restriction holds:* $s_c + (1 - s_c - \beta)s_f > 0$.

4) The numerical simulations introduced below specify $m_w(u)$, $m_f(i\ell)$, and $g_a(u)$ as linear functions. In that case, we obtain economically meaningful interior solutions.

This condition is called the Keynesian stability condition, which means that the own effect of the capacity utilization rate is negative.

The steady-state equilibrium value of the capacity utilization rate satisfies the following equation:

$$u = \frac{\alpha + (1 - s_c - \beta)s_f i\ell}{[s_c + (1 - s_c - \beta)s_f]m}. \tag{27}$$

When the Keynesian stability condition holds, the denominator on the right-hand side is positive. Hence, for the capacity utilization rate to be positive, the numerator of the capacity utilization rate also needs to be positive. Therefore, we introduce the following assumption.

Assumption 2. *The following restriction holds:* $\alpha + (1 - s_c - \beta)s_f i\ell > 0$.

As we explain below, $1 - s_c - \beta$ can be positive or negative. Hence, this assumption is satisfied when animal spirits α are relatively large.

J_{12} shows the effect of an increase in the profit share on the capacity utilization rate. When the Keynesian stability condition holds, we have $J_{12} < 0$, which is called "wage-led demand." Under our specification, "profit-led demand" does not occur.[5)]

J_{13} shows the effect of an increase in the debt/capital ratio on the capacity utilization rate. Then, we introduce the following definition.

Definition 1. *We define* $1 - s_c - \beta > 0$ *as "debt-led demand" (DLD), while* $1 - s_c - \beta < 0$ *as "debt-burdened demand" (DBD).*

In the DLD (DBD) case, an increase in the debt/capital ratio increases (decreases) the capacity utilization rate. Therefore, we obtain $J_{13} > 0$ in the DLD case, but $J_{13} < 0$ in the DBD case.

J_{21} shows the effect of an increase in the capacity utilization rate on the profit share. This effect depends on the size of the reserve army effect $m'_w(u)$ and that of the reserve army creation effect $g'_a(u)$, both of which are summarized as $\Gamma(u; \theta_w)$. If the reserve army effect is relatively strong, Γ is negative. On the other hand, if the reserve army creation effect is relatively weak, Γ is positive.

J_{22} shows the own effect of an increase in the profit share on the profit share. The own effect of the profit share is negative.

J_{23} shows the effect of an increase in the debt/capital ratio on the profit share. If the IBPP effect works, we obtain $J_{23} > 0$.

5) If we assume that there exists a household that obtains both wage and profit incomes instead of workers and capitalists, and assume that the household saves a constant fraction of its income, then, depending on the conditions, we obtain profit-led demand even if we use the above investment function (i.e., we do not use the Marglin?Bhaduri-type investment function).

J_{31} shows the effect of an increase in the capacity utilization rate on the debt/capital ratio. Since we assume that $0 < \beta < 1$, we obtain $J_{31} < 0$.

J_{32} shows the effect of an increase in the profit share on the debt/capital ratio. The first term on the right-hand side of J_{32} is negative and the second term is positive. Accordingly, the sign of J_{32} can be positive or negative.

J_{33} shows the own effect of an increase in the debt/capital ratio on the debt/capital ratio. The first term on the right-hand side of J_{33} is positive and the second and third terms are both negative. Therefore, J_{33} as a whole can be positive or negative.

Assumption 3. *The following restriction holds:*

$$s_f i(1-\beta+\beta\ell) - \theta_f i\ell m_f'(i\ell) - \frac{s_c[(1-s_f)um + s_f i\ell]}{\ell} < 0. \tag{28}$$

From the assumption, the own effect of an increase in the debt/capital ratio is negative. This assumption is likely to hold when the IBPP effect $m_f'(\cdot) > 0$ is relatively large.

To sum up, the combinations of the elements of the Jacobian matrix are given in Table 1.

Regime	DLD	DBD
J_{11}	$-$	$-$
J_{12}	$-$	$-$
J_{13}	$+$	$-$
J_{21}	$+/-$	$+/-$
J_{22}	$-$	$-$
J_{23}	$+$	$+$
J_{31}	$-$	$-$
J_{32}	$+/-$	$+/-$
J_{33}	$-$	$-$

Table 1: Signs of the elements of the Jacobian matrix

The characteristic equation corresponding to the Jacobian matrix $\mathbf{J}$ is given by

$$\lambda^3 + a_1\lambda^2 + a_2\lambda + a_3 = 0, \tag{29}$$

where λ_i ($i = 1, 2, 3$) denotes a characteristic root. Then, each coefficient of the characteristic equation is given by

$$a_1 = -\mathrm{tr}\,\mathbf{J} = -(J_{11} + J_{22} + J_{33}), \tag{30}$$

$$a_2 = (J_{11}J_{22} - J_{12}J_{21}) + (J_{22}J_{33} - J_{23}J_{32}) + (J_{11}J_{33} - J_{13}J_{31}), \tag{31}$$

$$a_3 = -\det \mathbf{J} = -J_{11}(J_{22}J_{33} - J_{23}J_{32}) + J_{21}(J_{12}J_{33} - J_{13}J_{32}) - J_{31}(J_{12}J_{23} - J_{13}J_{22}), \qquad (32)$$

where $\det \mathbf{J}$ denotes the determinant of $\mathbf{J}$ and $\mathrm{tr}\,\mathbf{J}$, the sum of diagonal elements of $\mathbf{J}$. The coefficient a_2 denotes the sum of the determinants of the principal second-order minors of $\mathbf{J}$.

The necessary and sufficient conditions for the steady-state equilibrium to be locally asymptotically stable are given by $a_1 > 0$, $a_2 > 0$, $a_3 > 0$, and $a_1 a_2 - a_3 > 0$.

The speed of the adjustment of the goods market ϕ is included in the diagonal elements J_{11}, J_{22}, and J_{33}. Hence, a_1, a_2, and a_3 are linear functions of ϕ, and $a_1 a_2 - a_3$ is a quadratic function of ϕ. Accordingly, we obtain

$$a_1 = A\phi + B, \qquad (33)$$

$$a_2 = C\phi + D, \qquad (34)$$

$$a_3 = E\phi, \qquad (35)$$

$$a_1 a_2 - a_3 = AC\phi^2 + (AD + BC - E)\phi + BD, \qquad (36)$$

where A, B, C, D, and E are given by

$$A = -\frac{J_{11}}{\phi}, \qquad (37)$$

$$B = -J_{22} - J_{33}, \qquad (38)$$

$$C = \frac{J_{11}(J_{22} + J_{33}) - J_{12}J_{21} - J_{13}J_{31}}{\phi}, \qquad (39)$$

$$D = J_{22}J_{33} - J_{23}J_{32}, \qquad (40)$$

$$E = \frac{-J_{11}(J_{22}J_{33} - J_{23}J_{32}) + J_{21}(J_{12}J_{33} - J_{13}J_{32}) - J_{31}(J_{12}J_{23} - J_{13}J_{22})}{\phi}. \qquad (41)$$

Moreover, $AD + BC - E$ is given by

$$AD + BC - E = \frac{-J_{11}(J_{22} + J_{33})^2 + J_{12}J_{21}J_{22} + J_{21}J_{13}J_{32} + J_{31}(J_{13}J_{33} + J_{12}J_{23})}{\phi}. \qquad (42)$$

We examine the sign of each coefficient a_i $(i = 1, 2, 3)$.

From our assumptions, we obtain $A > 0$ and $B > 0$.

We consider C. If $J_{13} > 0$, that is, the economy exhibits DLD, then we always have $C > 0$. This has a stabilizing effect. If $J_{13} < 0$, that is, the economy exhibits DBD, then we have $C < 0$ depending on the conditions. This has a destabilizing effect. Therefore, we obtain the following lemma.

Lemma 1. *Suppose that the economy exhibits DLD. Then, we always have $C > 0$. By* *contrast, suppose that the economy exhibits DBD. Then, we can have $C < 0$.*

We consider D. By calculating D, we obtain

$$D = (\theta_f + \theta_w)(1 - m)\left\{\frac{s_c(1 - s_f)um}{\ell} + s_f i[s_c - (1 - \beta + \beta\ell)]\right\} + \theta_f i m_f'(\cdot)(1 - m)[\theta_w \ell + s_f(1 - \beta + \beta\ell)u]. \tag{43}$$

Here, we make the following assumption.

Assumption 4. *The restriction $s_c > 1 - \beta + \beta\ell$ holds.*

This is a sufficient condition for $D > 0$, which implies that rentiers' saving rate has a lower bound.

We consider E. By calculating E, we obtain

$$E = \theta_f(1 - m)\ell m_f'(\cdot)(\sigma - \beta s_f)[\Gamma(u)u + \theta_w m] + s_c s_f i(1 - m)\{[s_c - (1 - \beta + \beta\ell)] + (1 - s_c - \beta)s_f\}[\Gamma(u)u + (\theta_f + \theta_w)m] + (1 - m)(\sigma - \beta s_f) \cdot \frac{s_c[(1 - s_f)um + s_f i\ell]}{\ell} \cdot [\Gamma(u)u + \theta_w m]. \tag{44}$$

By analyzing E, we obtain the following lemma.

Lemma 2. *Suppose that both $\Gamma(u)u + \theta_w m > 0$ and $s_c - (1 - \beta + \beta\ell) + (1 - s_c - \beta)s_f > 0$. Then, we have $E > 0$.*

If $\Gamma(u) > 0$ and $1 - s_c - \beta > 0$, that is, if the reserve army creation effect is relatively large and the economy exhibits DLD, we obtain $E > 0$, which contributes to the local stability of the steady-state equilibrium. Even if $\Gamma(u) < 0$ and $1 - s_c - \beta < 0$, that is, even if the reserve army effect is relatively large and the economy exhibits DBD, we can obtain $E > 0$ given that the absolute values of those two effects are small.

Suppose that ϕ is sufficiently close to zero and that $D > 0$. Then, we obtain $a_1 = B > 0$, $a_2 = D > 0$, and $a_1 a_2 - a_3 = BD > 0$, from which we obtain the following proposition.

Proposition 1. *Suppose that the adjustment speed of the goods market is sufficiently close to zero. Then, the steady-state equilibrium is locally asymptotically stable.*

This proposition does not depend on whether the economy exhibits DLD or DBD. Therefore, irrespective of whether the economy exhibits DLD or DBD, the steady-state equilibrium can be locally asymptotically stable if the adjustment of the goods market is sluggish.

Suppose that A, B, C, D, and E are all positive. If $AD + BC - E > 0$, then all the necessary and sufficient conditions are satisfied.

Proposition 2. *Suppose that $AD + BC - E > 0$. Then, the steady-state equilibrium is asymptotically locally stable.*

It is difficult to interpret this condition economically. However, this condition is satisfied under the specifications and parameter settings introduced by the numerical simulations below.

Ae mentioned in the Introduction, Hein (2007) shows that the long-run equilibrium is stable only when the short-run equilibrium exhibits debt-led growth and that the long-run equilibrium is necessarily unstable when the short-run equilibrium exhibits debt-burdened growth. By contrast, Sasaki and Fujita (2012) prove that Hein's (2007) result rests on the assumption that firms' retention ratio is equal to unity and that if the retention ratio is less than unity, the long-run equilibrium can be stable even if the short-run equilibrium exhibits debt-burdened growth.

The model of the present paper extends that of Sasaki and Fujita (2012) by endogenizing the profit share, which is exogenously given in Sasaki and Fujita (2012) and Hein (2007). Even if the profit share is endogenized, however, the result of Sasaki and Fujita (2012) concerning long-run stability holds. That is, irrespective of whether the economy exhibits DLD or DBD, the steady-state equilibrium can be stable depending on the conditions.

4 Numerical simulations

This section conducts numerical simulations to show that an economically meaningful steady-state equilibrium actually exists and can be stable. Moreover, we investigate the transitional dynamics along which an arbitrary initial value converges to the steady-state equilibrium.

For the analysis, we specify the reserve army effect, IBPP effect, and reserve army creation effect as follows:

$$m_w = \delta_0 - \delta_1 u, \quad \delta_0 > 0,\ \delta_1 > 0, \tag{45}$$

$$m_f = \psi_0 + \psi_1 i\ell, \quad \psi_0 > 0,\ \psi_1 > 0, \tag{46}$$

$$g_a = \eta u, \quad \eta > 0. \tag{47}$$

For ease of analysis, we use linear functions.

Moreover, we set all the parameters and initial values as shown in Table 2.

These numerical simulations show that in both the DLD cases (see Figures 1–5) and the DBD cases (see Figures 7–11), an arbitrary initial value converges to the steady-state equilibrium.

	α	β	ϕ	s_c	s_f	i	δ_0	δ_1	ψ_0	ψ_1	η	θ_f	θ_w
DLD Case	0.13	0.3	1	0.6	0.3	0.02	0.3	0.3	0.4	0.1	0.05	0.5	0.5
DBD Case	0.13	0.5	1	0.6	0.3	0.02	0.3	0.3	0.4	0.1	0.05	0.5	0.5

Table 2: Sets of the parameters and initial values

[Figures 1–5 and 7–11 around here]

The analysis of the transitional dynamics of the debt/capital ratio and capacity utilization rate shows interesting results (Figure 6).

[Figure 6 around here]

Looking at the transitional dynamics of the DLD case at the equilibrium, during the period when the economy starts from the initial point, the capacity utilization rate increases as the debt/capital ratio increases, which implies that the economy exhibits apparent DLD. However, from some point in time, the capacity utilization rate increases as the debt/capital ratio decreases, which implies that the economy exhibits apparent DBD. In the DBD case at the equilibrium, a similar argument holds (Figure 12).

[Figure 12 around here]

That is, the regime that holds at the steady-state equilibrium and the regime along the transitional dynamics can be different. This finding suggests that if we conduct empirical analysis to classify which regime is obtained in the real economy, we must pay attention to whether the economy is located at the equilibrium or along a transition path.

From a numerical calculation, we investigate the effects of decreases in the retention ratio and interest rate on income distribution. The income shares of rentiers and workers are defined as follows:

$$\text{Rentiers' income share} = \frac{(1-s_f)(rpK - iL) + iL}{pY} = (1-s_f)m + s_f i\,\frac{\ell}{u}, \tag{48}$$

$$\text{Workers' income share} = \text{Wage share} = 1 - m. \tag{49}$$

Table 3 shows that in the DLD case, a decrease in the retention ratio ($s_f = 0.3 \to 0.29$) increases both rentiers' income share and workers' income share (wage share). That is, income distribution that favors shareholders increases rentiers' income share and even workers' income share. In this case, the ratio of firms' retained earnings to national income declines. Shareholder-oriented income distribution generally seems unfavorable for workers. However, when the economy exhibits DLD, such income distribution can be favorable for workers. A decrease in the interest rate ($i = 0.02 \to 0.019$) lowers rentiers' income share, whereas it raises workers' income share. Therefore, an interest rate policy affects income distribution.

Retention rate	0.3	0.29	Interest rate	0.02	0.019
Rentiers' income share	0.196081	0.198666 ↑		0.196081	0.195897 ↓
Workers' income share	0.724672	0.724823 ↑		0.724672	0.724692 ↑

Table 3: Results of the comparative statics analysis in the DLD case

Table 4 shows that in the DBD case, a decrease in the retention ratio increases rentiers' income share and decreases workers' income share. In this case, shareholder-oriented income distribution is unfavorable for workers. A decrease in the interest rate lowers rentiers' income share, whereas it raises workers' income share.

Retention rate	0.3	0.29	Interest rate	0.02	0.019
Rentiers' income share	0.187932	0.190699 ↑		0.187932	0.187751 ↓
Workers' income share	0.735707	0.735476 ↓		0.735707	0.735751 ↑

Table 4: Results of the comparative statics analysis in the DBD case

The results in Table 3 and 4 are based on numerical simulations and not on an analytical method. Accordingly, we cannot state that a decrease in the retention ratio is always favorable for workers' income distribution when the economy exhibits DLD. However, our results show that the effect of financialization on income distribution is not unique.

5 Conclusions

This study investigates the degree to which increased shareholder power (i.e., a decrease in firms' retention ratio) affects the economy by building a Kaleckian model with firms' debt accumulation. Unlike many existing studies, we endogenize income distribution between rentiers and workers in order to examine the extent to which a decrease in the retention ratio influences income distribution.

The presented numerical simulations show that a decrease in the retention ratio increases both rentiers' income distribution and workers' income distribution when the steady-state equilibrium exhibits DLD. In addition, when the steady-state equilibrium exhibits DBD, a decrease in the retention ratio increases rentiers' income share and decreases workers' income share. The result that increased shareholder power increases both rentiers' and workers' income distribution is interesting. This result is obtained by endogenizing income distribution.

Future research should aim to examine the empirical relationship between the retention ratio and income distribution. Furthermore, our model endogenizes income distribution by introducing the reserve army effect, reserve army creation effect, and IBPP effect. Whether these three effects are empirically valid is left for future research.

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Figures

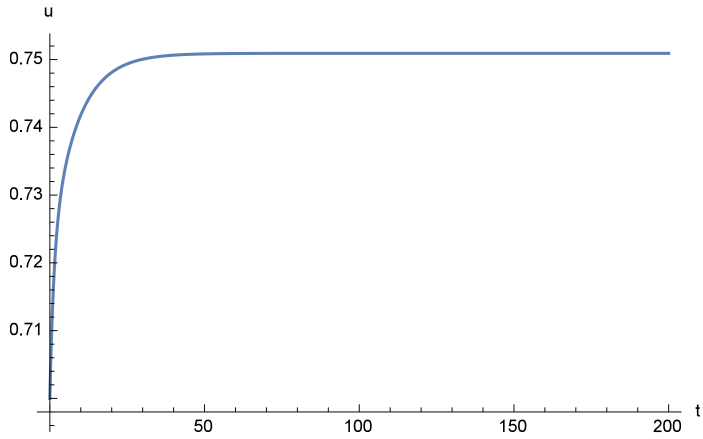

Figure 1: Dynamics of the capacity utilization rate in the DLD case

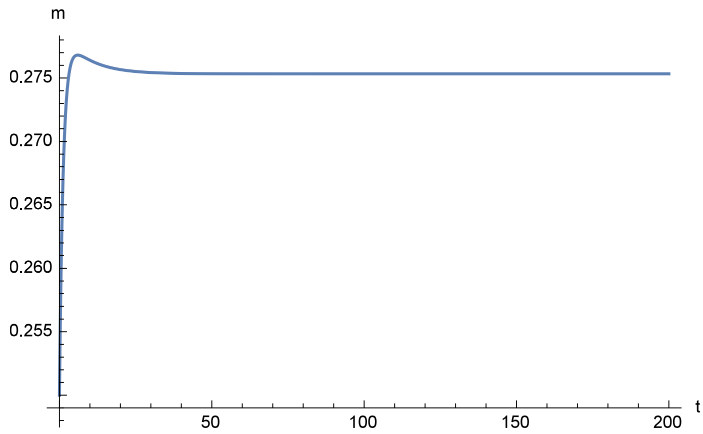

Figure 2: Dynamics of the profit share in the DLD case

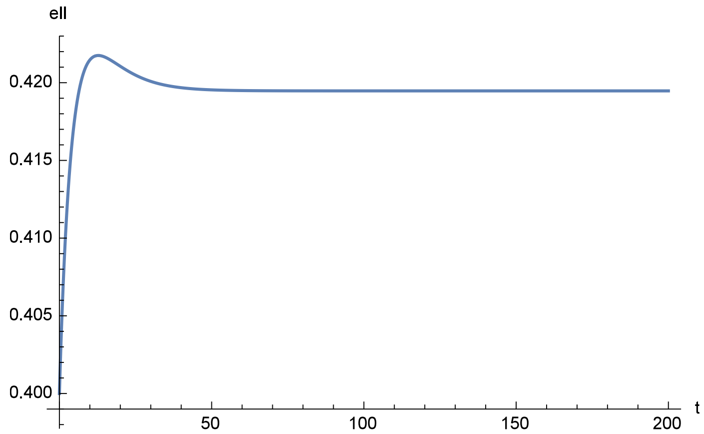

Figure 3: Dynamics of the debt/capital ratio in the DLD case

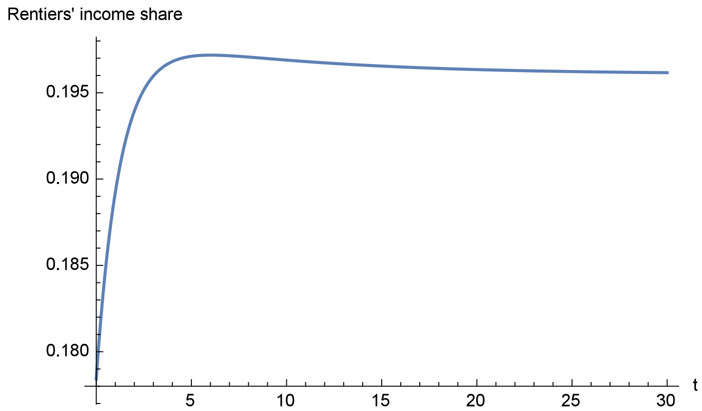

Figure 4: Dynamics of rentiers' income share in the DLD case

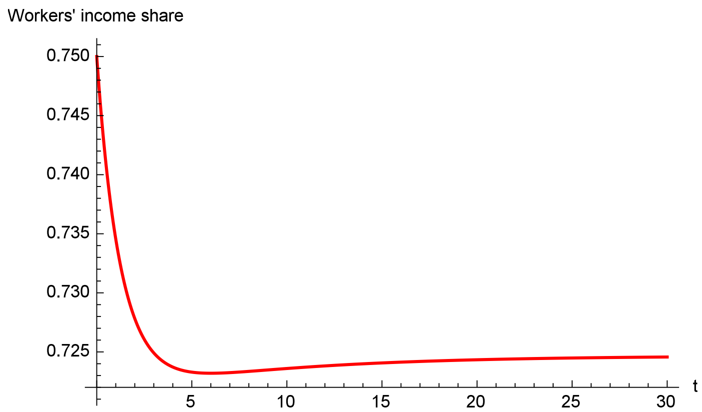

Figure 5: Dynamics of workers' income share in the DLD case

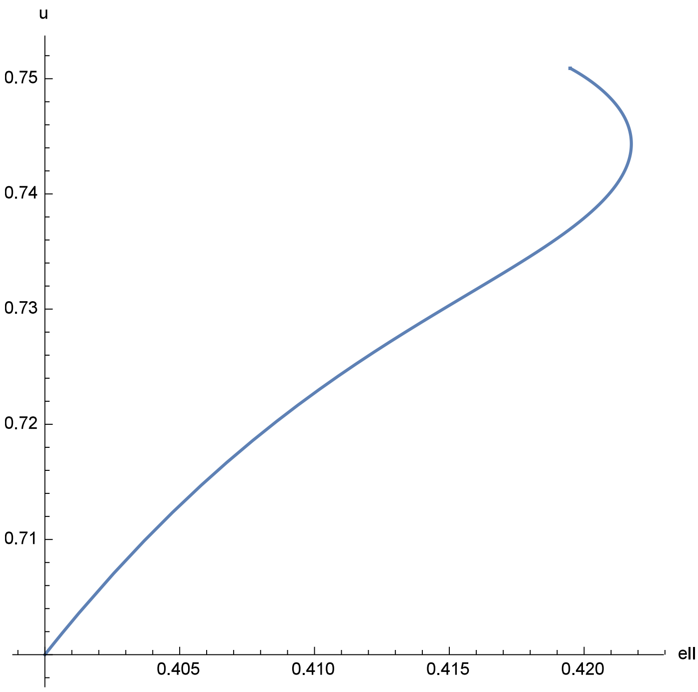

Figure 6: Dynamics of the debt/capital ratio and capacity utilization rate in the DLD case

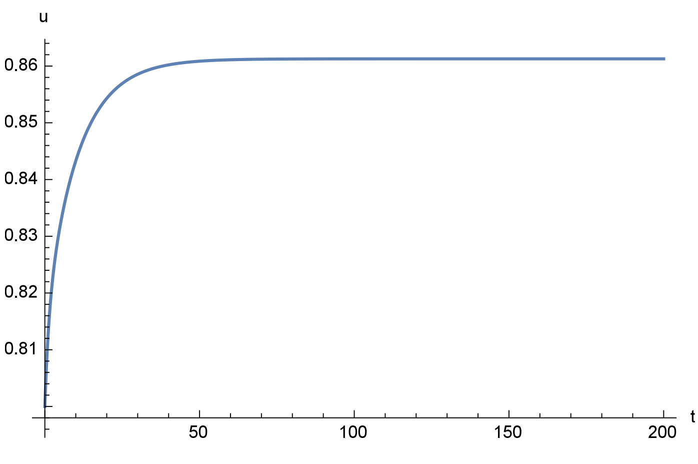

Figure 7: Dynamics of the capacity utilization rate in the DBD case

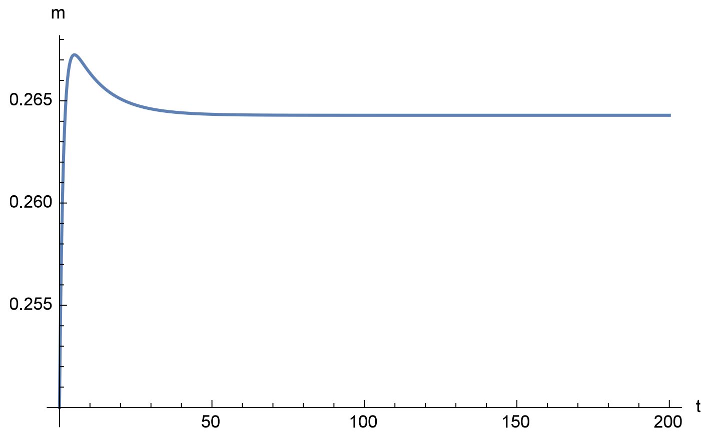

Figure 8: Dynamics of the profit share in the DBD case

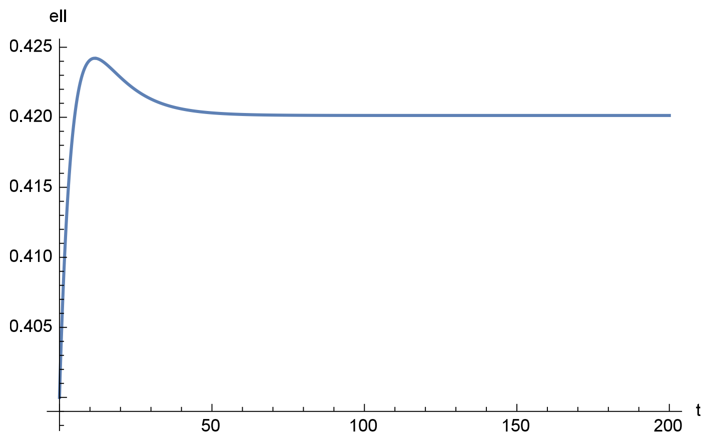

Figure 9: Dynamics of the debt/capital ratio in the DBD case

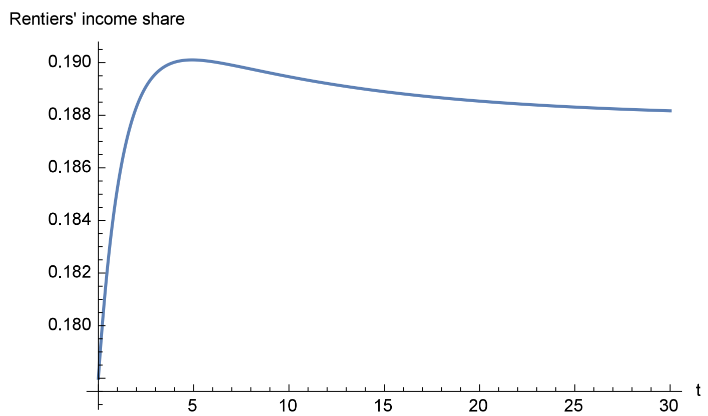

Figure 10: Dynamics of rentiers' income share in the DBD case

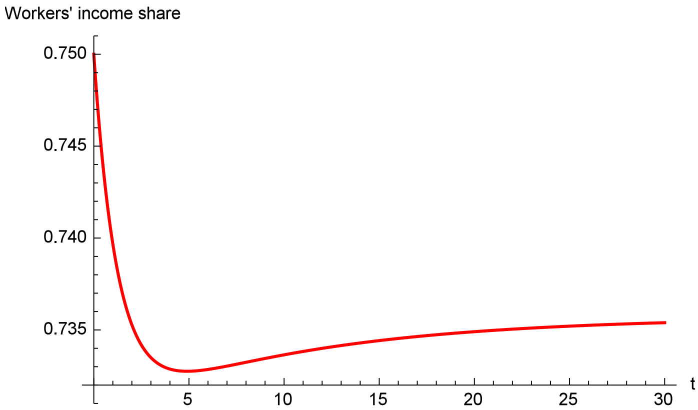

Figure 11: Dynamics of workers’ income share in the DBD case

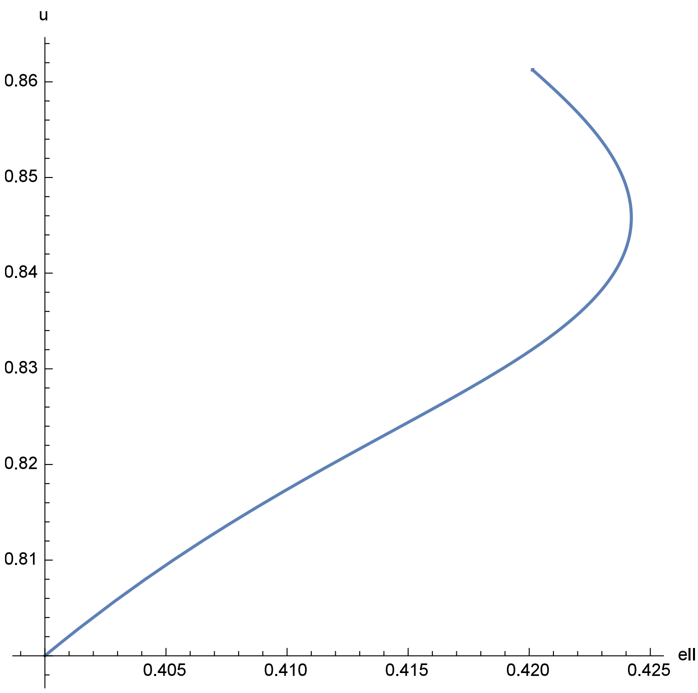

Figure 12: Dynamics of the debt/capital ratio and capacity utilization rate in the DBD case