Do the Economic Policies of Japan's "New Form of Capitalism" Create a Virtuous Cycle of Growth and Distribution?

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Abstract

In contemporary Japan, the realization of a virtuous cycle of growth and distribution (i.e., how the "new form of capitalism" should be) has been discussed. To examine the validity of economic policies suggested by the new form of capitalism, we present a Kaleckian model that considers the wage gap among workers and the retained earnings of firms, and investigate the effects of minimum wage, the rate of retained earnings, and profit sharing on growth and distribution. We reveal that a decrease in the rate of retained earnings and an increase in profit sharing do not lead to a virtuous cycle of growth and distribution, whereas a rise in the minimum wage increases the income share of workers and the economic growth rate. However, an increase in the minimum wage has a negative impact on employment, whereas a decline in the rate of retained earnings and an expansion of profit sharing have a positive effect.

Keywords: growth and distribution; Kaleckian model; minimum wage; retained earnings; profit sharing; Japan's new form of capitalism

JEL classification: E12; E25; J31; J53

1 Introduction

The relationship between growth and distribution has drawn considerable attention in Japan. The Kishida administration proposed a "new form of capitalism" and stressed

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the realization of a virtuous cycle of growth and distribution. This means that the fruits of economic growth are given back to workers, who then increase consumption demand, leading to further economic growth. Thus, an increase in wages or minimum wages is proposed. In addition, when Japanese firms accumulate retained earnings, they do not allocate such earnings to investment; hence, they should decrease retained earnings. However, these suggestions are not based on rigorous theoretical analyses. To understand this, we need an analysis grounded in a theoretical model. For this purpose, we extended the Kaleckian model of growth and distribution to explore these issues.

The basic framework of our model is as follows: There are four classes in the model economy: non-regular workers, regular workers, managers, and capitalists. Both non-regular and regular employment are forms of variable labor; as such, they change with actual output. Managers represent fixed labor; hence, they change with potential output. Non-regular workers earn a given minimum wage, whereas regular workers earn a higher wage. Both regular and non-regular workers consume all wage income and thus do not save. Managers earn wages and income from profit sharing. They save a constant proportion of their incomes. Managers earn a higher wage income than regular workers. Profit sharing is a firm policy that allocates a portion of a firm's profits to workers and is widely adopted in advanced economies (OECD Employment Outlook, 1995). Sasaki (2016) stated that firms utilize profit-sharing because they increase profits by incentivizing workers, thereby raising labor productivity. In addition, workers agree to profit-sharing because their total income rises if they receive profits. Capitalists obtain profits, allocate part of them to profit sharing, and save a fraction of the rest. Firms save a constant fraction of their profits as retained earnings and pay the rest to managers and capitalists as dividends. Firms conduct investment by using retained earnings.

We divide the model analysis into two periods: short run and medium run. In the short run, the capacity utilization rate is adjusted with two types of wage gaps being given. In the short-run equilibrium, the goods marker clears, and hence, the capacity utilization rate becomes constant. In the medium run, the two types of wage gaps are adjusted under the assumption that the short-run equilibrium is always attained. In the medium-run equilibrium, the two wage gaps become constant.

Previous studies have presented Kaleckian models that consider multiple forms of labor.[1)] Rowthorn (1981) built a Kaleckian model that considers variable and fixed

1) Flaschel and Greiner (2011) developed a Goodwin model with two kinds of labor. In this model, two kinds of labor differ in the determination of wages. Flaschel et al. (2012) also investigated a Goodwin model with two kinds of labor.

labor.[2] However, he did not consider the wage gap between the two forms of labor. Based on Rowthorn (1981), Raghavendra (2006) also presented a Kaleckian model with two types of labor. He endogenized the income distribution, which is fixed in Rowthorn (1981).

As a research that considers wage gap, we take Lavoie (2009). He introduced a wage gap into Rowthorn's (1981) model. However, the wage gap is given exogenously; hence, the income distribution is constant. Sasaki et al. (2013) developed a Kaleckian model with regular and non-regular employment. In their model, regular and non-regular employment correspond to fixed labor and variable labor, respectively. The wage gap is fixed, but the wages of regular workers can change, which endogenously determines income distribution. Sasaki (2016) also built a Kaleckian model with regular and non-regular employment. The difference from Sasaki et al. (2013) is that Sasaki (2006) introduced a profit-sharing rule such that part of the capitalists' profits is allocated to regular workers. Sasaki and Sonoda (2019) also provided a Kaleckian model with regular and non-regular employment. They considered two different determinations of wages.

The middle class was also considered by Tavani and Vasudevan (2014). They elaborated a Kaleckian model with three classes: workers, managers, and capitalists. In their model, the wage gap between workers and managers changes endogenously. Palley (2015) presented a Kaleckian model with workers, middle managers, and top managers. In this model, middle managers act as both workers and capitalists. Setterfield et al. (2016) and Setterfield and Kim (2020) developed Kaleckian models with workers and managers.

Our model integrates the findings of the above studies, introduces four classes, and, similar to Palley (2015), considers managers who act as both workers and capitalists. Our main contribution is presenting a model that examines the feasibility of a virtuous cycle of growth and distribution.

The results reveal that a decline in the rate of retained earnings and an increase in profit sharing raise the income share of both workers but lower the economic growth rate. By contrast, a rise in the minimum wage increases the income share of both workers and raises the economic growth rate. In this sense, an increase in minimum wage leads to a virtuous cycle of growth and distribution.

The remainder of this paper is organized as follows. Section 2 uses data on the Japanese economy to observe the movement of the main variables. Section 3 presents

2) Dutt et al. (2015) elaborated a Kaleckian model with short-term and long-term labor. They introduced the index of employment adjustment; it is an endogenous variable. In their model, the wage gap between two forms of labor is fixed.

the basic framework of our theoretical model. Section 4 delves into a short-run analysis in which the short run is defined as the interval in which the capacity utilization rate is adjusted as an endogenous variable. Section 5 conducts a medium-run analysis in which two types of wage gaps are adjusted as endogenous variables; hence, the income distribution is adjusted. Section 6 specifies the parameters of the model using data on the Japanese economy, and conducts numerical simulations to investigate how the economic policies of a new form of capitalism affect the main variables. Finally, Section 7 concludes the study.

2 Overview of the Japanese economy

This section reviews the main variables related to the purpose of this study. Here, we present data on the economic growth rate, the capacity utilization rate, the profit share, minimum wage, the rate of retained earnings, the ratio of non-regular to regular employment, the wage gap between regular and non-regular employment, and the manager ratio.

GDP growth rate

Figure 1 shows the real GDP growth rates between 2000 and 2020 (left-hand side), taken from the National Accounts of Japan. As displayed in the figure, Japan's economic growth has stagnated. This tendency is similar to that in terms of per capita real GDP growth because the population of Japan continues to shrink.

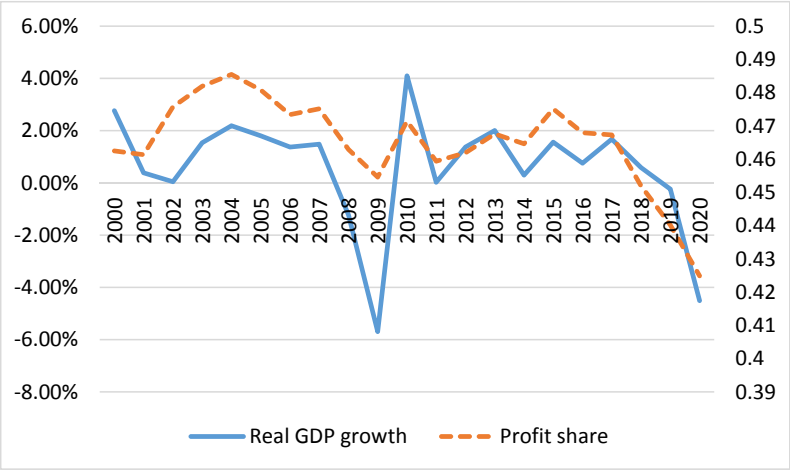

Figure 1: The relationship between profit share and GDP growth

Profit share

There are several ways to calculate the profit share. Here, we defined wage share as the ratio of employee compensation to the sum of employee compensation, operating surplus, and the consumption of fixed capital. We then calculated the profit share by subtracting the wage share from unity. We obtained data from the National Accounts of Japan and the Annual Report on the Japanese Economy and Public Finance. Figure 1 presents the profit shares for 2000–2020 (right-hand side). Up to 2017, they did not change much, but after that, they had a negative trend; hence, the wage shares exhibited a positive trend. Piketty (2014) reported that the profit share in advanced economies has increased while the wage share has decreased, and that inequality has widened. However, in Japan alone, inequality did not grow between 2000 and 2020; rather, it declined.

In addition, Figure 1 indicates that profit share and real GDP growth moved in almost the same direction, suggesting that the Japanese economy is a profit-led growth economy. Azetsu et al. (2011) and Nishi (2011) conducted an empirical analysis using structural VAR models and impulse response functions and found that the Japanese economy is a profit-led growth economy.

Capacity utilization rate

Figure 2 depicts the capacity utilization rates between 2000 and 2020, which we obtained from the Indices of Industrial Production of the Ministry of Economy, Trade, and Industry. From 2001 to 2007, they increased; however, after the subprime loan problem in 2007 and the global recession in 2009, they fell significantly and remained low. Thus, the Japanese economy has stagnated in terms of the capacity utilization rate.

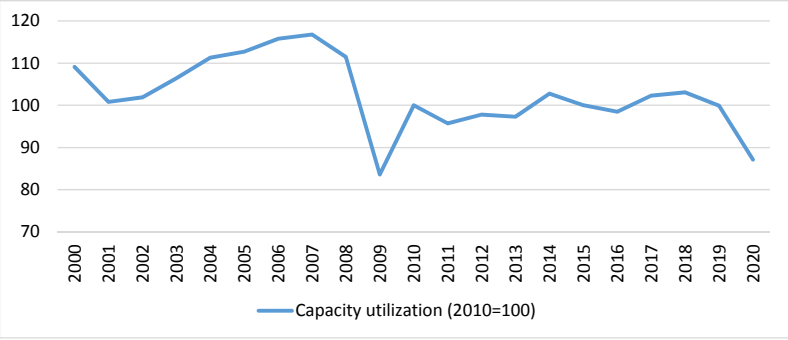

Figure 2: Capacity utilization rate

Tendency of non-regular employment

Figure 3 shows the ratio of non-regular to regular employment between 2010 and 2020. We used data from the Labor Force Survey of the Ministry of Internal Affairs and Communications. As the figure shows, the rate of non-regular employment has been increasing. Owing to the expansion of COVID-19, it declined in 2020 but was still higher than the level in 2010.

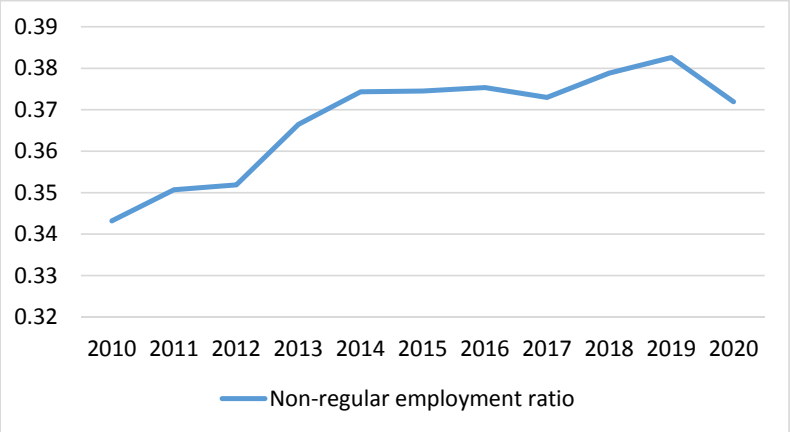

Figure 3: Ratio of non-regular to regular employment

Figure 4 shows the wage gap between regular and non-regular employment between 2010 and 2019. We used data from the Basic Survey on Wage Structure administered by the Ministry of Health, Labour, and Welfare. Overall, the wage gap gradually declined. Nevertheless, the wage of regular employment is approximately 1.5 times higher than that of non-regular employment.

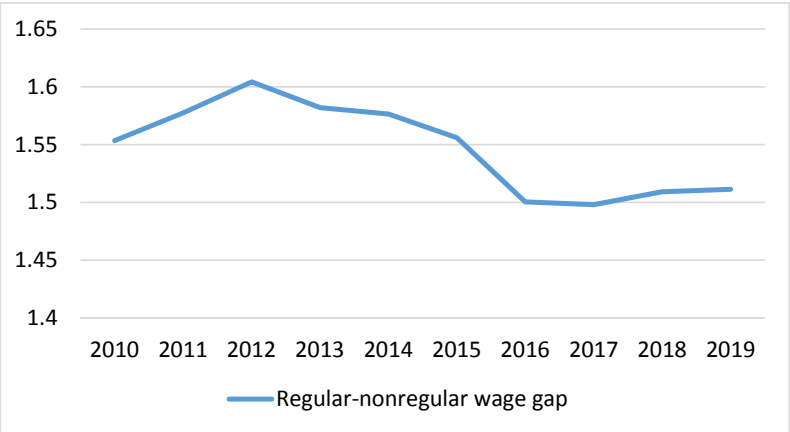

Figure 4: The wage gap between regular and non-regular employment

Manager ratio

Figure 5 shows the manager ratio for 2010–2021. We used data from the Basic Survey on Wage Structure administered by the Ministry of Health, Labour, and Welfare. According to Oi (2005), officers above section chiefs are called managers in a broad sense, and the manager ratio is defined as the ratio of managers to the sum of managers and non-managers. From 2010 to 2016, it rose, declined until 2019, and then increased again.

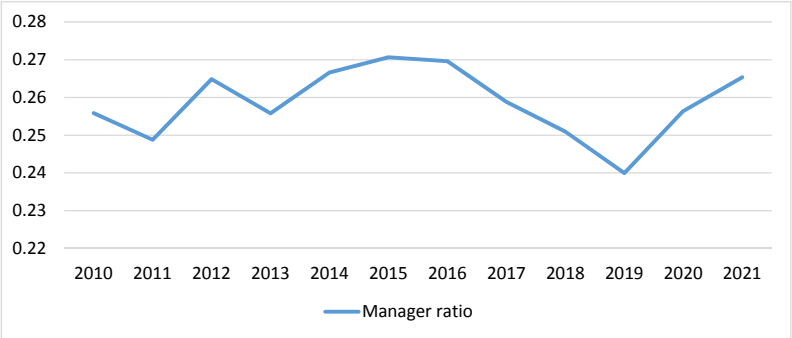

Figure 5: The manager ratio

Minimum wage

Figure 6 outlines the movement of the minimum wage from 2002 to 2020. We used data from the List of Regional Minimum Wages administered by the Ministry of Health, Labour, and Welfare. Minimum wages in Japan are decided upon regionally, ranging from 820 yen in Kochi and Okinawa to 1041 yen in Tokyo in fiscal year 2021. The graph indicates that the weighted average of all regions in Japan is increasing. However, the Japanese minimum wage in 2020 ranks 14th among economies of member states of the Organisation for Economic Co-operation and Development (OECD) that adopted the minimum wage, and in this sense, it is low.[3)]

3) According to the statistics of the OCED, the minimum wage in Japan in terms of purchasing power parity is 8.03 dollars, while those in Luxembourg and the U.S. are 13.27 and 7.59 dollars, respectively.

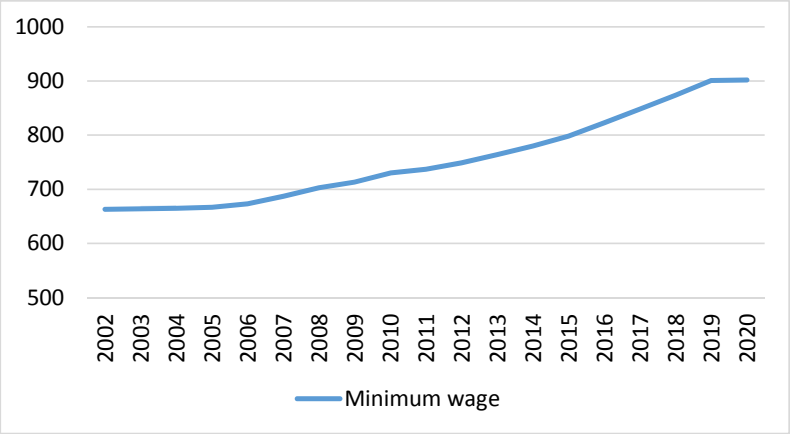

Figure 6: Minimum wage

Rate of retained earning

Figures 7 and 8 depict the retained earnings and the rate of retained earnings between 2000 and 2020. We used data from the Financial Statements Statistics of Corporations by Industry, derived from the Ministry of Finance. We defined the retained earnings rate as the ratio of retained earnings to a firm's net profits. In 2001, the net profit was negative; hence, we calculated the rate of retained earnings as 11, which is unrealistic. Then, we set it to zero. Japanese firms hold large amounts of retained earnings, which is reflected in Figures 7. However, this number declined in 2017. The rate of retained earnings fell sharply during the 2007–2009 global financial crisis but averaged approximately 0.4.

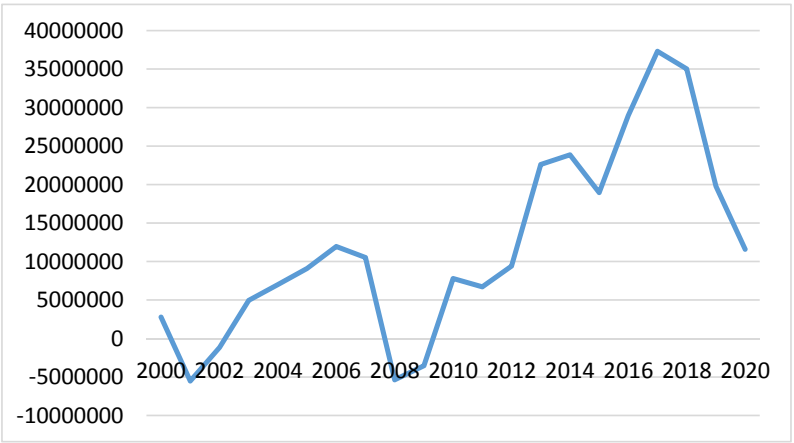

Figure 7: Retained earnings

Figure 8: Rate of retained earnings

3 Model

Suppose an economy that produces one final good using regular and non-regular workers, managers, and capital. The final goods are used for both consumption and investment. The production function of the firms takes the Leontief form as follows:

$$Y = \min\{(1/\alpha)L_n, (1/\beta)L_r, (1/\gamma)uL_m, \sigma uK\}. \tag{1}$$

Y denotes output, L_n is non-regular employment, L_r is regular employment, L_m are managers, Y^c is potential output, K is capital stock, and $u = Y/Y^c$ is the capacity utilization rate. Parameter α denotes the input coefficient of non-regular employment, β is the input coefficient of regular employment, γ is the input coefficient of managers, and $\sigma = Y^c/K$ is the potential output-capital ratio. The specifications for regular and non-regular employment follow Sonoda and Sasaki (2019), while those for managers follow Lavoie (2009).

From the production function, the total employment L is given by

$$L = L_n + L_r + L_m = \alpha Y + \beta Y + \gamma Y^c. \tag{2}$$

Thus, each employment share leads to

$$\frac{L_n}{L} = \frac{\alpha u}{(\alpha+\beta)u + \gamma}, \tag{3}$$

$$\frac{L_r}{L} = \frac{\beta u}{(\alpha+\beta)u + \gamma}, \tag{4}$$

$$\frac{L_m}{L} = \frac{\gamma}{(\alpha+\beta)u+\gamma}. \tag{5}$$

Accordingly, the non-regular and regular employment ratios are increasing functions of the capacity utilization rate, and the manager ratio is a decreasing function of the capacity utilization rate.

The non-regular employment ratio is given by

$$\frac{L_n}{L_n+L_r} = \frac{\alpha}{\alpha+\beta}. \tag{6}$$

Hence, if we decrease α and increase the labor productivity of non-regular workers, the non-regular employment ratio decreases.

The average labor productivity of the entire economy is given by

$$\frac{Y}{L} = \frac{u}{(\alpha+\beta)u+\gamma}. \tag{7}$$

This is an increasing function of the capacity utilization rate. Thus, it rises with an increase in the capacity utilization rate, and falls with a decrease in the capacity utilization rate. This suggests that the average labor productivity exhibits a procyclical movement, which corresponds to the reality of the Japanese economy.

Let w_n, w_r, and w_m denote the real wage rates of non-regular workers, regular workers, and managers, respectively. Then, we define the wage gap between regular and non-regular workers as ε_1 and that between managers and regular workers as ε_2.

$$\varepsilon_1 = \frac{w_r}{w_n},\ \varepsilon_1 > 1, \tag{8}$$

$$\varepsilon_2 = \frac{w_m}{w_r},\ \varepsilon_2 > 1. \tag{9}$$

Here, we assume that the real wage rate of regular workers is higher than that of non-regular workers ($\varepsilon > 1$), and that of managers is higher than that of regular workers ($\varepsilon_2 > 1$). Under our specifications, $\varepsilon_1 \times \varepsilon_2 = w_m/w_n$ denotes the wage gap between managers and non-regular workers. These two wage gaps are constant in the short run and adjusted in the medium run. Let $w_{\min}$ denote the minimum wage. We assume that the real wage rate of non-regular workers is equal to the minimum wage $w_n = w_{\min}$.

We consider profit and wage shares. Let π and ω denote profit and wage share, respectively. National income is decomposed into wage and profit income; hence, the

following relations hold:

$$\begin{aligned} Y &= wL + rK = (w_n L_n + w_r L_r + w_m L_m) + rK \\ &= w_{\min}(\alpha Y + \varepsilon_1 \beta Y + \varepsilon_1 \varepsilon_2 \gamma Y^c) + rK. \end{aligned} \tag{10}$$

where w indicates the average real wage and r is the profit rate. Because the profit share is $\pi = rK/Y$ and the wage share is $\omega = wL/Y$, we obtain the following relationship:

$$\pi = 1 - w_{\min}\left(\alpha + \beta\varepsilon_1 + \gamma \frac{\varepsilon_1 \varepsilon_2}{u}\right). \tag{11}$$

$$\omega = 1 - \pi = w_{\min}\left(\alpha + \beta\varepsilon_1 + \gamma \frac{\varepsilon_1 \varepsilon_2}{u}\right). \tag{12}$$

The profit share is less than unity. Hence, we assume $1 - w_{\min}\left(\alpha + \beta\varepsilon_1 + \gamma \frac{\varepsilon_1 \varepsilon_2}{u}\right) > 0$. In the short run, profit share changes as the capacity utilization rate changes. All other things being equal, a rise in the capacity utilization rate increases the profit share. This is because a rise in the capacity utilization rate increases the average labor productivity of the entire economy. In the medium-run, the profit share changes as the wage gap changes. The profit share is a decreasing function of $w_{\min}$, ε_1, and ε_2: This is because an increase in wages decreases the profit share.

Let σ_i denote each class's income share. Subsequently, we obtain the following relationship:

$$\sigma_n \equiv \frac{w_n L_n}{Y} = \alpha w_{\min}, \tag{13}$$

$$\sigma_r \equiv \frac{w_r L_r}{Y} = \beta w_{\min} \varepsilon_1, \tag{14}$$

$$\sigma_m \equiv \frac{w_m L_m + (1 - s_f)\phi r K}{Y} = \phi(1 - s_f)[1 - w_{\min}(\alpha + \beta\varepsilon_1)] + \gamma[1 - \phi(1 - s_f)] w_{\min} \frac{\varepsilon_1 \varepsilon_2}{u}, \tag{15}$$

$$\sigma_c \equiv \frac{(1 - s_f)(1 - \phi) r K}{Y} = (1 - s_f)(1 - \phi)\left[1 - w_{\min}\left(\alpha + \beta\varepsilon_1 + \gamma \frac{\varepsilon_1 \varepsilon_2}{u}\right)\right], \tag{16}$$

$$\sigma_f \equiv \frac{s_f r K}{Y} = s_f\left[1 - w_{\min}\left(\alpha + \beta\varepsilon_1 + \gamma \frac{\varepsilon_1 \varepsilon_2}{u}\right)\right]. \tag{17}$$

Here, ϕ is a parameter that captures profit sharing. The distribution between managers and capitalists is $\phi \in [0, 1)$ and is assumed to be constant.

The income share of non-regular workers is an increasing function of the minimum wage. The regular workers' income share is an increasing function of the minimum

wage and the income gap between regular and non-regular workers. The manager's income share is a decreasing function of the minimum wage and an increasing function of the wage gap between managers and regular workers. This depends on whether managers' income share is an increasing function of the wage gap between regular and non-regular workers.

In the short run, the income shares of non-regular and regular workers are independent of the capacity utilization rate. In contrast, managers' income share depends on the capacity utilization rate. The manager's income share is decomposed into wages and profits. The wage income of managers is a decreasing function of the capacity utilization rate, while the profit income of those is an increasing function of the capacity utilization rate. The effect of an increase in the capacity utilization rate on the managers' income share depends on which effect is larger. Capitalist income share is an increasing function of the capacity utilization rate. A firm's income share (i.e., the ratio of retained earnings to national income) is an increasing function of the capacity utilization rate.

Following Sasaki (2016), we assume that profit-sharing increases the labor productivity of managers.[4)]

$$\gamma = \gamma(\phi), \quad \gamma'(\phi) < 0. \tag{18}$$

We now turn to specification savings. In our model, the firms, managers, and capitalists conduct savings. Firms own a fraction $s_f \in [0, 1)$ of their profits as retained earnings and allocate the remaining $1 - s_f$ to managers and capitalists as dividends. Managers obtain wages and dividends, and save a fraction s_m of their income. Capitalists save s_c of their dividends.

$$S_f = s_f r K, \tag{19}$$

$$S_m = s_m[w_m L_m + (1 - s_f)\phi r K], \tag{20}$$

$$S_c = s_c(1 - s_f)(1 - \phi) r K. \tag{21}$$

Here, s_f refers to the rate of retained earnings, s_m is the managers' savings rate, and s_c is the capitalists' savings rate. All savings rates are greater than zero or less than unity. Moreover, we assume that $s_m < s_c$. From these, savings as the whole economy

4) In numerical simulations introduced later, we do not specify the functional form of γ, and instead decrease γ from 0.003 to 0.0028 as we increase ϕ from 0.1 to 0.15.

are given by

$$S = s_f rK + s_m[w_m L_m + (1 - s_f)\phi rK] + s_c(1 - s_f)(1 - \phi)rK. \tag{22}$$

Let $g^s = S/K$ denote savings per capital stock. Then, we have

$$g^s = (s_m - s)\sigma\gamma w_{\min}\varepsilon_1\varepsilon_2 + s\sigma[1 - w_{\min}(\alpha + \beta\varepsilon_1)] \cdot u. \tag{23}$$

Here, we defined $s = s_f + s_m(1 - s_f)\phi + s_c(1 - s_f)(1 - \phi)$. Assuming that $s_m < s_c$, s is a decreasing function of ϕ. Additionally, s is a decreasing function of s_f.

In the saving function, we assume that the coefficient of the capacity utilization rate is positive; that is, $1 - w_{\min}(\alpha + \beta\varepsilon_1) > 0$. This makes the slope of the saving function positive. The sign of the intercept of the saving function depends on the sign of $s_m - s$: Under a plausible range of parameters, we obtain

$$s_m - s < 0. \tag{24}$$

In this case, the intercept of the saving function is negative.

We specify the investment function as follows. For ease of analysis, we assume that firms appropriate retained earnings for investments and do not borrow. Let I denote firms' equipment investments. Let g^d denote the investment per capital stock. Suppose that g^d is an increasing function of the retained earnings per capital stock ($s_f rK/K = s_f r$).

$$g^d = a + b \cdot s_f r, \quad a > 0,\ b > 0. \tag{25}$$

Here, the parameter a denotes the animal spirits of firms and b is the response of investment to retained earnings. This investment function follows Charles (2008a, 2008b). These investment functions are supported by empirical studies (Hayashi and Inoue, 1991; Hoshi et al. (1991); Fazzari et al., 1988; Ndikumana, 1999).

Further calculations yield the following:

$$g^d = a - bs_f\sigma\gamma w_{\min}\varepsilon_1\varepsilon_2 + bs_f\sigma[1 - w_{\min}(\alpha + \beta\varepsilon_1)] \cdot u. \tag{26}$$

Thus, the slope of the investment function is positive. On the other hand, the intercept can be positive or negative. We assume that the intercept of the investment function

is positive.

$$a - bs_f\sigma\gamma w_{\min}\varepsilon_1\varepsilon_2 > 0. \tag{27}$$

This is likely to hold when firms' animal spirits are large.

We consider a short-run adjustment about the capacity utilization rate. We introduce a quantity adjustment such that the capacity utilization rate will increase when the goods market exhibits excess demand and decrease when there is excess supply.

$$\dot{u} = \psi(g^d - g^s), \quad \psi > 0. \tag{28}$$

Here, ψ is a parameter capturing the speed of adjustments in the goods market.

In the medium-run, the two types of wage gaps are endogenous variables. We specify the wage gap dynamics as follows:

$$\dot{\varepsilon}_1 = \eta_0 + \eta_1 u - \eta_2\varepsilon_1, \tag{29}$$

$$\dot{\varepsilon}_2 = \delta_0 - \delta_1 u + \delta_2\varepsilon_2. \tag{30}$$

All parameters aree assumed to be constant and positive.

Equation (29) shows the dynamics of the wage gap between regular and non-regular workers. Since the real wage rate of non-regular workers is fixed at the minimum wage, equation (29) indicates that a change in the real wage of regular workers is an increasing function of the capacity utilization rate and a decreasing function of itself. If Okun's law holds in the short run, an increase in the capacity utilization rate corresponds to an increase in the employment rate. Hence, our specification resembles that of Goodwin's (1967) growth-cycle model. The specification that ε_1 has a negative own effect means that there is a negative feedback effect, such that the real wage rate of regular workers returns to a constant value.

Equation (30) presents the wage gap dynamics between managers and regular workers. This specification follows the work of Tavani and Vasudevan (2014), and in turn follows the empirical studies of Mohun (2006) and Galbraith (2012). Mohun (2006) reveals a rise in managers' classes and the resultant expansion of inequality, and points out that the rise of managers leads to an income distribution that is favorable for managers. Accordingly, the wage gap has a positive feedback effect on the wage gap itself. Galbraith (2012) found a positive correlation between inequality and unemployment. From this, we observed a negative correlation between the wage gap and the capacity utilization rate.

4 Short-run equilibrium

We define the short run as the period in which the capacity utilization rate is adjusted with the wage gaps ε_1 and ε_2 given. The short-run equilibrium is a situation in which $\dot{u} = 0$, from which we obtained $g^d = g^s$. Figure 9 shows that the short-run equilibrium capacity utilization rate and the capital accumulation rate are determined at the intersection of the investment and saving functions.

For a short-run equilibrium to exist, the slope of the saving function must be steeper than that of the investment function, which is given by

$$s - bs_f > 0. \tag{31}$$

This is also a condition under which the quantity adjustment in the short run is stable, which is usually called the Keynesian stability condition. In the following, we assume the Keynesian stability condition.[5)]

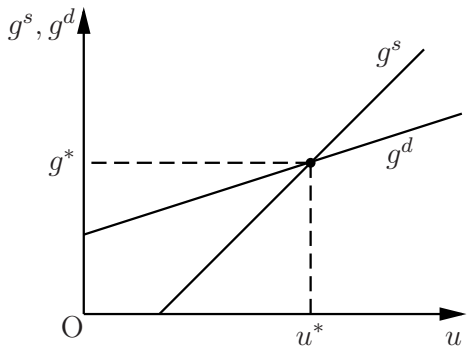

Figure 9: Determination of short-run equilibrium

The short-run equilibrium capacity utilization is given by[6)]

$$u^* = \frac{a + \sigma\gamma[s - s_m - bs_f]w_{\min}\varepsilon_1\varepsilon_2}{\sigma[s - bs_f][1 - w_{\min}(\alpha + \beta\varepsilon_1)]} \tag{32}$$

For the short-run equilibrium capacity utilization rate to be positive, we require $1 -$

5) Peter Skott criticizes the validity of the Keynesian stability condition. See, for example, Skott (2010, 2012).

6) The short-run equilibrium profit rate is given by

$$r^* = \frac{a - s_m\sigma\gamma w_{\min}\varepsilon_1\varepsilon_2}{s - bs_f}.$$

For the profit rate to be positive, we require $a - s_m\sigma\gamma w_{\min}\varepsilon_1\varepsilon_2 > 0$. The short-run equilibrium profit rate is a decreasing function of $w_{\min}$ and the two types of wage gaps.

$w_{\min}(\alpha + \beta\varepsilon_1) > 0$.[7] This is the condition under which the slopes of the saving and investment functions are positive.

Next, we turn to equation (32). The effect of an increase in $w_{\min}$ in the short-run equilibrium depends on the sign of $s - s_m - bs_f$.

First, when $s - s_m - bs_f > 0$, we obtain the following relationship:

$$\frac{\partial u^*}{\partial w_{\min}} > 0, \tag{33}$$

$$\frac{\partial u^*}{\partial \varepsilon_1} > 0, \tag{34}$$

$$\frac{\partial u^*}{\partial \varepsilon_2} > 0. \tag{35}$$

A rise in the real wage rate of non-regular workers increases the short-run equilibrium capacity utilization rate. These results indicate that a rise in wages increases the capacity utilization rate.

Second, when $s - s_m - bs_f < 0$, we obtain the following relationship:

$$\frac{\partial u^*}{\partial w_{\min}} \gtreqless 0, \tag{36}$$

$$\frac{\partial u^*}{\partial \varepsilon_1} \gtreqless 0, \tag{37}$$

$$\frac{\partial u^*}{\partial \varepsilon_2} < 0. \tag{38}$$

An increase in the real wage rate of non-regular workers either increases or decreases the short-run equilibrium capacity utilization rate. An increase in the wage gap between regular and non-regular workers either increases or decreases the short-run equilibrium capacity utilization rate. Additionally, an increase in the wage gap between managers and regular workers decreases the short-run equilibrium capacity utilization rate.

Based on the above observations, we define $\partial u^*/\partial \varepsilon_i > 0$ and $\partial u^*/\partial \varepsilon_i < 0$ as the wage- and profit-led demand regimes, respectively. Under this definition, we obtain

7) From this condition, the wage gap between regular and non-regular workers must satisfy the following inequality.

$$1 < \varepsilon_1 < \frac{1}{\beta}\left(\frac{1}{w_{\min}} - \alpha\right).$$

For the right-hand side of this inequality to be greater than unity, we require

$$\frac{1}{\beta}\left(\frac{1}{w_{\min}} - \alpha\right) > 1.$$

the following proposition for the demand regimes:

Proposition 1. *If the saving rates satisfy* $s - s_m - bs_f > 0$*, then the short-run equilibrium exhibits a wage-led demand regime. If the saving rates satisfy* $s - s_m - bs_f < 0$*, the short-run equilibrium exhibits either a wage-led or profit-led demand regime for the real wage rates of non-regular and regular workers, and a profit-demand regime for the real wage rate of managers.*

The short-run equilibrium capital accumulation rate is given by

$$g^* = \frac{as - bs_f s_m \sigma\gamma w_{\min}\varepsilon_1\varepsilon_2}{s - bs_f}. \tag{39}$$

The denominator of Equation (39) is positive because the Keynesian stability condition holds. For the short-run equilibrium capital accumulation rate to be positive, we require $as(\phi, s_f) - bs_f s_m \sigma\gamma w_{\min}\varepsilon_1\varepsilon_2 > 0$. From equation (39), we have the following:

$$\frac{\partial g^*}{\partial w_{\min}} < 0, \tag{40}$$

$$\frac{\partial g^*}{\partial \varepsilon_1} < 0, \tag{41}$$

$$\frac{\partial g^*}{\partial \varepsilon_2} < 0. \tag{42}$$

Accordingly, an increase in wages decreases the capital accumulation rate, leading to the following proposition.

Proposition 2. *In the short run, the economy exhibits a profit-led growth regime.*

As stated in Section 2, data on the Japanese economy and some empirical studies suggest that the economy displays profit-led growth. Our theoretical results are consistent with these empirical findings.

5 Medium-run equilibrium

This section presents a medium-run analysis. We define the medium-run as the period when ε_1 and ε_2 are adjusted as endogenous variables on the condition that a short-run equilibrium is always attained. From the short-run analysis, we know that the capacity utilization rate is a function of two types of wage gaps. Hence, we can write this as $u = u(\varepsilon_1, \varepsilon_2)$. Therefore, the differential equations for ε_1 and ε_2 can be rewritten as

follows:

$$\dot{\varepsilon}_1 = \eta_0 + \eta_1 u(\underset{(+/-)}{\varepsilon_1}, \underset{(+/-)}{\varepsilon_2}) - \eta_2 \varepsilon_1, \tag{43}$$

$$\dot{\varepsilon}_2 = \delta_0 - \delta_1 u(\underset{(+/-)}{\varepsilon_1}, \underset{(+/-)}{\varepsilon_2}) + \delta_2 \varepsilon_2. \tag{44}$$

From the analysis in Section 4, we see that the effect of an increase in ε_1 or ε_2 on the capacity utilization rate is either positive or negative.

The medium-run equilibrium is the situation in which $\dot{\varepsilon}_1 = 0$ and $\dot{\varepsilon}_2 = 0$. We assume that an economically meaningful unique medium-run equilibrium would exist.[8)]

Linearizing the differential equations around the medium-run equilibrium, we obtain the Jacobian matrix $\mathbf{J}$, whose elements are as follows:

$$J_{11} = \frac{\partial \dot{\varepsilon}_1}{\partial \varepsilon_1} = \eta_1 \frac{\partial u}{\partial \varepsilon_1} - \eta_2, \tag{45}$$

$$J_{12} = \frac{\partial \dot{\varepsilon}_1}{\partial \varepsilon_2} = \eta_1 \frac{\partial u}{\partial \varepsilon_2}, \tag{46}$$

$$J_{21} = \frac{\partial \dot{\varepsilon}_2}{\partial \varepsilon_1} = -\delta_1 \frac{\partial u}{\partial \varepsilon_1}, \tag{47}$$

$$J_{22} = \frac{\partial \dot{\varepsilon}_2}{\partial \varepsilon_2} = -\delta_1 \frac{\partial u}{\partial \varepsilon_2} + \delta_2. \tag{48}$$

All elements are evaluated around the medium-run equilibrium. For the medium-run equilibrium to be asymptotically and locally stable, we need the trace of $\mathbf{J}$ to be negative ($\mathrm{tr}\,\mathbf{J} < 0$) and the determinant of $\mathbf{J}$ to be positive ($\det \mathbf{J} > 0$).

In the following, according to the sign of $s - s_m - bs_f$, we investigate the stability analysis.

5.1 Case of $s - s_m - bs_f > 0$

In this case, the effects of increases in ε_1 on u and ε_2 on u are positive. Then, J_{11} and J_{22} can be positive or negative. Accordingly, we obtain the following four subcases: (i) $J_{11} > 0$ and $J_{22} > 0$, (ii) $J_{11} < 0$ and $J_{22} < 0$, (iii) $J_{11} > 0$ and $J_{22} < 0$, and (iv) $J_{11} < 0$ and $J_{22} > 0$.

(i) Both J_{11} and J_{22} are positive

8) We obtain the medium-run equilibrium as follows. First, from $\dot{\varepsilon}_2 = 0$, we obtain ε_2 as a solution to the linear equation with ε_1 given. Then, we can write the resultant expression as $\varepsilon_2(\varepsilon_1)$: By substituting $\varepsilon_2(\varepsilon_1)$ into $\dot{\varepsilon}_1 = 0$, we obtain a quadratic equation for ε_1. By solving this quadratic equation, we obtain ε_1^*, from which we derive $\varepsilon_2^* = \varepsilon_2(\varepsilon_1^*)$.

In this subcase, $\operatorname{tr}\mathbf{J} > 0$, which does not satisfy one of the stability conditions. We have $J_{11} > 0$ when the effect of the wage gap between regular and non-regular workers is too strong, and η_2 is too small. We have $J_{22} > 0$ when the effect of the wage gap between managers and regular workers is too small and δ_2 is too large.

(ii) Both J_{11} and J_{22} are negative

In this subcase, we have $\operatorname{tr}\mathbf{J} < 0$ and $\det\mathbf{J} > 0$. Then, all stability conditions are satisfied. Thus, the economy converges to a medium-run equilibrium.

(iii) and (iv) J_{11} and J_{22} have different signs

In this subcase, we have $\operatorname{tr}\mathbf{J} < 0$ depending on the conditions. In addition, we have $\det\mathbf{J} > 0$ depending on the conditions. Therefore, when J_{11} and J_{22} have different signs, the medium-run equilibrium can be stable or unstable.

5.2 Case of $s - s_m - bs_f < 0$

In this case, an increase in ε_1 either increases or decreases u whereas an increase in ε_2 decreases u. Then, for the wage gap between regular and non-regular workers, the economy exhibits a wage-led or profit-led demand regime, and for the wage gap between managers and regular workers, it exhibits a profit-led demand regime. Therefore, we divide this case into the following two subcases:

(v) Wage-led demand for ε_1

In this subcase, the signs of the elements of the Jacobian matrix are as follows.

$$J_{11} = \frac{\partial\dot{\varepsilon}_1}{\partial\varepsilon_1} = \eta_1\frac{\partial u}{\partial\varepsilon_1} - \eta_2, \tag{49}$$

$$J_{12} = \frac{\partial\dot{\varepsilon}_1}{\partial\varepsilon_2} = \eta_1\frac{\partial u}{\partial\varepsilon_2} < 0, \tag{50}$$

$$J_{21} = \frac{\partial\dot{\varepsilon}_2}{\partial\varepsilon_1} = -\delta_1\frac{\partial u}{\partial\varepsilon_1} < 0, \tag{51}$$

$$J_{22} = \frac{\partial\dot{\varepsilon}_2}{\partial\varepsilon_2} = -\delta_1\frac{\partial u}{\partial\varepsilon_2} + \delta_2 > 0. \tag{52}$$

For the trace of $\mathbf{J}$ to be negative, we require $J_{11} < 0$. However, if $J_{11} < 0$, the determinant of $\mathbf{J}$ must be negative. Hence, the medium-run equilibrium is unstable.

(vi) Profit-led demand for ε_1

In this subcase, the signs of the elements of **J** are given by

$$J_{11} = \frac{\partial \dot{\varepsilon}_1}{\partial \varepsilon_1} = \eta_1 \frac{\partial u}{\partial \varepsilon_1} - \eta_2 < 0, \tag{53}$$

$$J_{12} = \frac{\partial \dot{\varepsilon}_1}{\partial \varepsilon_2} = \eta_1 \frac{\partial u}{\partial \varepsilon_2} < 0, \tag{54}$$

$$J_{21} = \frac{\partial \dot{\varepsilon}_2}{\partial \varepsilon_1} = -\delta_1 \frac{\partial u}{\partial \varepsilon_1} > 0, \tag{55}$$

$$J_{22} = \frac{\partial \dot{\varepsilon}_2}{\partial \varepsilon_2} = -\delta_1 \frac{\partial u}{\partial \varepsilon_2} + \delta_2 > 0. \tag{56}$$

The trace and determinant can be positive or negative. As such, the medium-run equilibrium can be stable or unstable.

5.3 Summary

From the stability analysis, we obtain the following two propositions.

Proposition 3. *Suppose that $s - s_m - bs_f > 0$; hence, a wage-led demand regime is established for the two types of wage gaps. Then, the medium-run equilibrium is asymptotically and locally stable either when the effect of an increase in the wage gap between regular and non-regular workers on the capacity utilization rate is small and the self-negative feedback effect is large, or when the effect of an increase in the wage gap between managers and regular workers on the capacity utilization rate is large and the self-positive feedback is small.*

Proposition 4. *Suppose that $s - s_m - bs_f < 0$ and the medium-run equilibrium shows a wage-led demand regime with respect to the wage gap between regular and non-regular workers, whereas it demonstrates a profit-led demand regime with respect to the wage gap between managers and regular workers. Subsequently, the medium-run equilibrium becomes unstable.*

In addition to Proposition 3, as η_1 becomes smaller, the medium-run equilibrium gets more stable. The parameter η_1 captures the reserve army effect. As Sasaki et al. (2013a) and Sasaki et al. (2013b) explained, the equilibrium under a wage-led demand regime becomes more unstable when the reserve army effect becomes large. In contrast, the equilibrium under the profit-led demand regime becomes more stable when the reserve army effect becomes large. Our results are consistent with those of previous studies.

6 Numerical simulations

Our model includes several cases. Hence, we conduct numerical simulations to judge which case will apply to the Japanese economy, and we investigate whether a virtuous cycle will be attained by certain economic policies.

Based on data from the Japanese economy, we use the following values for the parameters and initial values:

$$
\begin{aligned}
&s_m = 0.145,\ s_c = 0.21,\ s_f = 0.4,\ \phi = 0.1,\\
&a = 0.1,\ b = 0.325,\\
&\alpha = 0.037,\ \beta = 0.064,\ \gamma = 0.003,\ \sigma = 1,\\
&w_{\min} = 4.85,\\
&\eta_0 = 0.291,\ \eta_1 = 0.01,\ \eta_2 = 0.2,\ \delta_0 = 0.233,\ \delta_1 = 0.3,\ \delta_2 = 0.000001,\\
&\varepsilon_1(0) = 1.49383,\ \varepsilon_2(0) = 1.61558.
\end{aligned}
$$

The parameters were set as follows:

- The saving rates are calculated by using the "Survey of Households' Financial Behavior" published by the Bank of Japan in 2018. This survey provides saving rates according to household income levels, which are classified into five income categories (Table 1). According to the Basic Survey on Wage Structure administered by the Ministry of Health, Labour and Welfare, the average annual income of officers is about 8.38 million yen; hence, we define the annual income of managers as 7.50–12.00 million yen, and the annual income of capitalists as over 12.00 million yen. From this, the saving rate of managers is 0.145 and that of capitalists is 0.21.

Table 1: Saving rates by income level

Annual income	Number of households	Saving rate (%)	Classes
No income	65	6	Workers
Below 3 million yen	510	6	Workers
3–5 million yen	1094	8	Workers
5–7.5 million yen	1230	12	Workers
7.5–10 million yen	469	14	Managers
10–12 million yen	223	15	Managers
12 million yen or more	307	21	Capitalists

- The rate of retained earnings is set to $s_f = 0.4$ from Figure 8.
- The sharing parameter is set to to $\phi = 0.1$.
- The parameters of the investment function follows Kumar et al. (2018). They used the investment function $g^d = a + b_0 r$, and estimated $b_0 = 0.13$. Since we assume that investment is an increasing function of retained earnings, we set $b = b_0/s_f = 0.13$. With $s_f = 0.4$, we obtain $b = 0.325$. Their estimate is based on the U.S. data and our study focuses on the Japanese economy. However, many empirical studies suggest that like the Japanese economy, the U.S. economy exhibits profit-led growth; as such, we use their estimate as an approximation.
- The labor input coefficients α and β are the period average values by using real GDP, the numbers of non-regular and regular workers. To calculate the labor input coefficient γ, we need potential GDP and the number of officers. We took potential GDP from the data of the Cabinet Office of Japan. Then, we compute γ as the period average.
- The potential output-capital ratio is set to unity.
- The minimum wage is set to 4.85 for the short-run endogenous variables to match the corresponding actual values.
- The parameters of the wage adjustment equations are set for the medium-run equilibrium values to match the corresponding actual values. This specification is rather arbitrary. However, to conduct comparative static analysis, we need the medium-run equilibrium to be stable. For this reason, we employ it.

We conduct the following numerical simulations: Using these parameters, we obtain the medium-run equilibrium and define it as the benchmark. Then, we slightly change the parameter, obtain a new medium-run equilibrium, and compare it with the benchmark. We simultaneously investigate the transitional dynamics from the benchmark to a new medium-run equilibrium. Accordingly, the initial values $(\varepsilon_1(0), \varepsilon_2(0))$ are benchmark medium-run equilibrium values. .

Under these parameter settings, all the above-mentioned assumptions and constraints are satisfied. Then, the Japanese economy corresponds to the case where $s - s_m - bs_f > 0$. As Figure 10 shows, the locus of $\dot{\varepsilon}_1 = 0$ is upward sloping and that of $\dot{\varepsilon}_2 = 0$ is downward sloping. Thus, the medium-run equilibrium is asymptotically and locally stable.

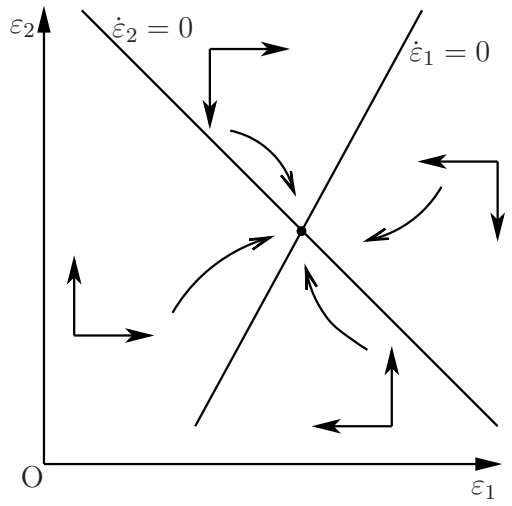

Figure 10: Determination of medium-run equilibrium

We consider the following parameter changes as economic policies for the new form of capitalism: (a) an increase in the minimum wage, (b) an increase in the sharing parameter, and (c) a decrease in the rate of retained earnings.

Minimum wage Increase the minimum wage $w_{\min}$ from 4.85 to 4.9.

Sharing parameter Increase the sharing parameter ϕ from 0.1 to 0.15. Simultaneously, to raise the labor productivity of managers, decrease γ from 0.003 to 0.0028.

Rate of retained earing Decrease the rate of retained earning s_f from 0.4 to 0.35.

The results of the numerical simulations of the transitional dynamics are as follows: The wage gap between regular and non-regular workers and the income share of regular workers overshoot or undershoot from the benchmark to a new medium equilibrium. Hence, we present these graphs. The other variables either increase or decrease monotonically from the benchmark to the new medium-run equilibrium. For details, see Table 2.

Minimum wage As Figure 11 shows, the wage gap between regular and non-regular workers overshoots. In other words, the wage gap declines at the new equilibrium but rises and then falls during the transition. As Figure 12 indicates, the income share of regular workers increases sharply and then drops. At the new equilibrium, it is higher than the benchmark value.

Sharing parameter As Figure 12 depicts, the wage gap between regular and non-regular workers undershoots. In other words, the wage gap increases at the new

equilibrium, but declines and then rises. As Figure 14 shows, the income share of regular workers undershoots. As a new equilibrium, it is higher than the benchmark value, but falls sharply and then increases along the transition.

Rate of retained earning As Figure 15 presents, the income gap between regular and non-regular workers undershoots. In other words, the wage gap increases at the new equilibrium, falls, and then rises along the transition. As Figure 16 indicates, the income share of regular workers undershoots. It increases at the new equilibrium, sharply declines, and then increases along the transition.

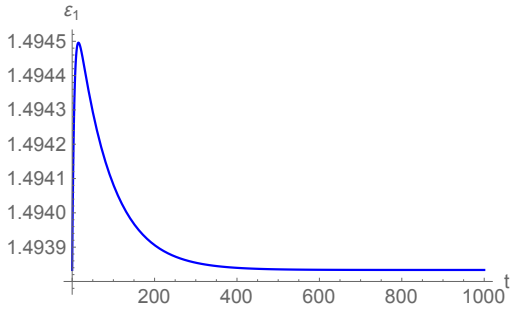

Figure 11: Regular–non-regular wage gap ($w_{\min} \uparrow$)

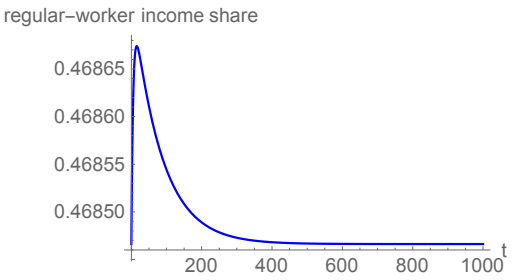

Figure 12: Regular workers' income share ($w_{\min} \uparrow$)

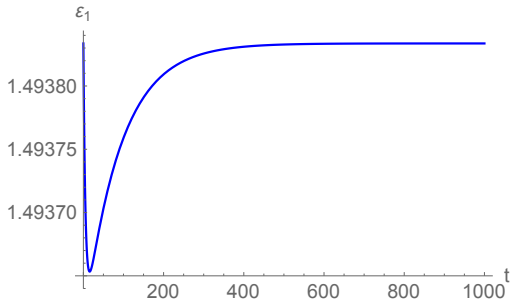

Figure 13: Regular–non-regular wage gap ($\phi \uparrow$ and $\gamma \downarrow$)

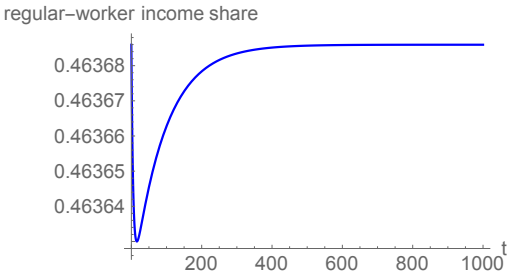

Figure 14: Regular workers' income share ($\phi \uparrow$ and $\gamma \downarrow$)

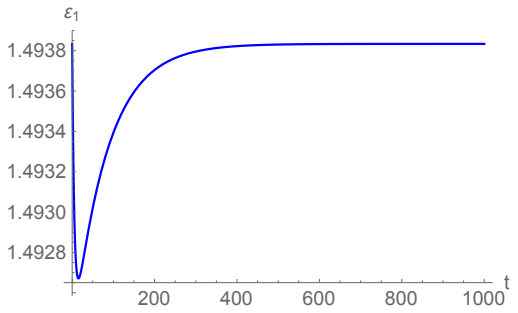

Figure 15: Regular–non-regular wage gap ($s_f \downarrow$)

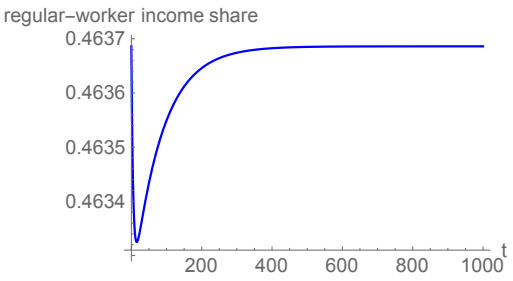

Figure 16: Regular workers' income share ($s_f \downarrow$)

Table 2: Results of numerical simulations

	Benchmark	Minimum wage	Profit sharing	Retention ratio
Wage gap 1	1.4938	−	+	+
Wage gap 2	1.6156	−	+	+
Wage share	0.6883	−	+	+
Profit share	0.3117	+	−	−
Non-regular workers' income share	0.1794	+	0	0
Regular-workers' income share	0.4637	+	+	+
Managers' income share	0.0639	−	+	+
Capitalists' income share	0.1683	+	−	−
Firms' income share	0.1247	+	−	−
Capacity utilization	0.7767	−	+	+
Capital accumulation	0.1315	+	−	−
Non-regular employment share	0.3528	−	+	+
Regular-employment share	0.6103	−	+	+
Manager employment share	0.0368	+	−	−

From the numerical simulations, we can state the following regarding whether an economic policy leads to a virtuous cycle of growth and distribution.

First, an increase in the minimum wage decreases the two types of wage gaps. This decreases the average wage share of the entire economy, which in turn increases the profit share. The income share of non-regular workers is an increasing function of the minimum wage. As such, a rise in the minimum wage increases the income share of non-regular workers. The income share of regular workers is an increasing function of the minimum wage and also an increasing function of the wage gap. Thus, an increase in the minimum wage has two opposite effects on the income share of regular workers. In our numerical simulations, the positive effect dominates the negative effect; therefore, the income share of regular workers increases. Because our model exhibits a profit-led growth regime, a rise in profit share increases the economic growth rate. Thus, an increase in the minimum wage is favorable for a virtuous cycle of

growth and distribution. In this case, the income share of managers decreases, and that of capitalists increases. When $s - s_m - bs_f > 0$, the model exhibits a wage-led demand regime. A rise in the minimum wage increases the capacity utilization rate, whereas a decrease in the two types of wage gaps decreases the capacity utilization rate. Overall, the latter negative effects dominate the former positive effect; hence, the capacity utilization rate declines. Because the employment shares of regular and non-regular workers are increasing functions of the capacity utilization rate, a decline in the capacity utilization rate decreases these employment shares. Therefore, an increase in the minimum wage has a negative effect on worker employment.

Second, a decrease in the rate of retained earnings increases the two types of wage gaps. The income share of non-regular workers is independent of the rate of retained earnings and thus does not change. The income share of regular workers is an increasing function of the wage gap; as such, it increases. The average wage share of the entire economy rises and the profit share falls, which decreases the economic growth rate because the economy exhibits a profit-led growth regime. Income distribution improves, but growth slows; hence, a decline in the rate of retained earnings does not lead to a virtuous cycle of growth and distribution. In this case, the managers' income share increases, whereas that of capitalists decreases. Because the economy displays a wage-led demand regime, a rise in the wage gap increases the capacity utilization rate, which also increases the employment of workers. The employment share of regular and non-regular workers grows, whereas that of managers shrinks.

Third, a rise in the profit-sharing parameter with a rise in the labor productivity of managers increases the two types of wage gaps. The average wage share of the entire economy increases and in turn, the profit share falls. In this case, the income share of non-regular workers does not change, that of regular workers rises, and the economic growth rate decreases. Therefore, an increase in the profit-sharing parameter does not lead to virtuous growth or a distribution cycle.

In sum, for the Japanese economy, a decrease in the retained earnings rate and an increase in profit sharing do not lead to a virtuous cycle, whereas an increase in the minimum wage does. An increase in the minimum wage increases incomes of non-regular and regular workers. An increase in profit sharing increases income of managers and decreases income of capitalists. A decrease in the retained earnings rate increases incomes of managers and capitalists. Accordingly, we can say that minimum wage increase that directly raises workers' income causes a virtuous cycle between growth and distribution. Nevertheless, an increase in the minimum wage has a negative effect on workers' employment. In contrast, a decline in the rate of retained earnings and a

rise in profit sharing have positive effects on workers' employment.

7 Conclusion

We built a Kaleckian model with four classes—non-regular workers, regular workers, managers, and capitalists—and investigated the relationship between growth and distribution. We present a framework for analyzing economic issues such as regular and non-regular employment, the rise of managers, and increased retained earnings.

Our results indicate that an increase in the minimum wage is favorable for a virtuous cycle of growth and distribution. This policy increases the income share of regular and non-regular workers and increases the economic growth rate. The Japanese economy is considered to be a profit-led growth regime. Nevertheless, increases in the income shares of workers and the economic growth rate are compatible. In this case, the income shares of regular and non-regular workers, capitalists, and firms increase, whereas those of managers decrease. Managers obtain both wages and profits; in this sense, they act as both workers and capitalists. Accordingly, this virtuous cycle of growth and distribution is attained through a decrease in managers' income shares. However, this policy lowers the employment of regular and non-regular workers. As such, policymakers must consider the trade-off between growth-distribution and employment.

It is said that Japanese firms accumulate retained earnings and that a portion of those should be allocated to wage increases and dividends to achieve a virtuous cycle of growth and distribution. If an economic policy decreases firms' retained earnings, all other things being equal, it expands the income of capitalists and managers. This, in turn, increases consumption and effective demand, which may lead to economic growth. In addition, a rise in effective demand may increase the employment share of regular and non-regular workers and their income share. However, as our analysis shows, a decline in the rate of retained earnings decreases firms' investment and hence lowers the economic growth rate. Therefore, it is difficult to state that a decrease in firms' retained earnings leads to a virtuous cycle of growth and distribution.

Finally, our model considers only the effective demand creation effect of investment and does not consider the capital accumulation effect of investment. If capital accumulation progresses with investment, new employment is created. Future research should consider this capital accumulation effect and labor supply constraints simultaneously, and build a long-run Kaleckian model in which the employment rate is constant in the long run.

Declaration of competing interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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