The Determination of Money Wages in the Post Keynesian Spirit

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Abstract: *This paper deals with the determination of money wages in a monetary production economy. Based on a Kaleckian-type Kaldorian model, we construct a model of endogenous determination of money wages that reflects Post Keynesian understanding, and test the empirical validity of the money wage function for the case of Japan. The results suggest that this function has an interpretative value both theoretically and empirically.*

1. Introduction

In the Post Keynesian tradition, two variables are particularly important in determining economic growth, economic fluctuations, and the distributive shares of income. These variables are *investment* and the *money wage rate*. Since the determination of investment has been dealt with elsewhere (Iyoda, 2005), this paper focuses on the determination of money wages in the Post Keynesian spirit, a topic which the large body of work on the determination of money wages has little considered[1].

Key words: *determination of money wages, empirical test for Japan, Post Keynesian spirit, Kalecki-type Kaldorian model. JEL classifications: E12, E24.*

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Post Keynesians, such as Davidson, recognise that "modern economies can be characterized as money-wage contract-based systems," and give importance to the money wage contract (Davidson, 1994, p. 17). Indeed, Davidson states that "the money wage contract is the most ubiquitous forward contract in modern economies" and that this forward labour contracting "provides a basis for the conventionality of belief in the stickiness or stability in the price of something over time" (1978, p. 389). Money wages are determined by historical, economic, institutional, and social factors, and post Keynesians consider the aggregate level of the money wage as "a historical datum," and as "the anchor on which the actual level of nominal values in the entire system depends" (Seccareccia, 2003, p. 383).

This paper is organised as follows. In the following section, we outline a *Kalecki-type Kaldorian* (*KK*) model of income distribution that lays the foundation for money wage determination. We then move onto constructing a model of money wage determination, before testing the money wage function for the case of Japan. The final section of the manuscripts presents the conclusions of this work.

2. The Kalecki-Kaldorian (*KK*) Model

The *KK* model[2] assumes the following:

i. A single product closed private economy;

ii. The capital stock and the labour force are given in the short run, but change in the long run;

iii. Price is set by marking up wages and depreciation at a customary rate, supposing that this price is generally realised on a macro level;

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1)　Keynes (1936, ch. 19) fully discussed the effects of "changes in money-wages," but did not present a full discussion on the determination of money wages. See Kaufman (2002) for a survey of models of union wage determination, and Sanfey (1995) for a survey of insiders and outsiders in union models. Layard, R. *et al.* (2005) comprehensively deal with unemployment, referring to NAIRU (non-accelerating inflation rate of unemployment). Davidson (1998) presents the Post Keynesian employment analysis, arguing against NAIRU.

2)　See Iyoda (1997), and Iyoda and Matthews (2001) for a *KK* model.

and

iv. (*i*) The increase of investment has the effect of increasing the number of the labour force employed in an underemployment economy until the full employment of capital, and *vice versa* for a decrease of investment. (*ii*) The increase of employment causes the growth of labour productivity, and *vice versa* for the decrease of employment in the short run.

We follow the notation of Kaldor (1955-56), but with the exception that variables are in nominal gross terms[3] not in real net terms (uppercase letters for aggregates and lowercase letters for rates except for *e*).

Y = output
W = wages (including salaries)
P = profits
I = investment
S = savings
D = depreciation
L = labour force employed
r = markup rate
e = price level
w = money wage rate
d = rate of depreciation of capital
K = quantity of capital at book value
μ = labour productivity per head at constant price
L_f = full employment labour force
L_{fk} = labour force employed under full employment of capital
s_p and s_w = propensity to save from profits and wages (and salaries), respectively

The model consists of the following equations:[4]

Distribution of Output	$Y \equiv W+P$	(1)
Investment-Savings Relations	$I \equiv S$	(2)
Total Savings	$S \equiv s_w W+s_p P$	(3)
Price Setting Equation	$Y = W+r(W+D)$	(4)
Productivity-Employment (Function)	$\mu \equiv (Y/eL) = f(L)$	(5)

3) This is because, for nominal terms, we do not take 'the classical dichotomy' (Patinkin, 1956), instead aiming at dealing with the effect of the money wage rate on other macroeconomic variables. See Iyoda (2005, p.120, note 5) for gross terms.

4) The two equations (4) and (5) are different from those in our original *KK* model. The markup rate r of equation (4) is redefined in gross terms. The productivity-employment function (5) is not specified.

Total Output　　$Y \equiv e\mu L$　　(6)

Wages Paid　　$W \equiv wL$　　(7)

Depreciation (Capital Consumption)　　$D \equiv edK$　　(8)

Equations (1)-(3) and (6)-(8) are identities (we also assume simple proportional savings $S_w = s_w W$ and $S_p = s_p P$). Equation (4) is based on assumption *iii*. This price equation is in the spirit of Kalecki (1954), and Hall and Hitch (1939). Equation (5) is based on assumption *iv*.

We now examine a model consisting of equations (1)-(8). Suppose that Kaldor's treatment (*i.e.* the Keynesian hypothesis) with I as an independent variable is accepted, and the other six variables shown below are given, the number of unknown variables is equal to eight. We then have eight equations, so that the model has a solution. The relationship is articulated as follows:

7 exogenous variables　I, s_w, s_p, r, w, d, and K

8 unknown variables　Y, W, P, S, L, μ, e, and D

8 equations (including identities)　(1)-(8)

The model is subject to the following two restrictions:

(i)　All variables are non-negative, and

(ii)　$0 \leq s_w < s_p \leq 1$.

Among the seven exogenous variables, investment is the strategic factor. At this stage, wage is treated as exogenous, but we aim to produce a theory for it.

This model has a similarity to Kaldor's. By using equations (1) - (3), we have Kaldor's equation to explain the relative share of profit: $P/Y = \{I/Y (s_p - s_w)\} - s_w/(s_p - s_w)$. However, the model differs from Kaldor's in the following: (i) Variables (Y, P, I, S, K) are expressed in *nominal gross* terms; and (ii) equations (4) and (5) are added to complete the model that encompasses an *underemployment economy*.

3. Determination of the Money Wage Rate

The status of models of union wage determination developed since Dunlop (1944) and Ross (1948) is surveyed by Kaufman (2002)[5]. Dealing

5)　Kaufman discusses the major shortcomings of the literature. First, "the majority of researchers have chosen to work within an unduly narrow,

with the determination of the money wage rate may be one of the most difficult questions in the Post Keynesian tradition. The wage contract between employers and employees is made in terms of money wages, and as such this contract is an important base for running a business.

The literature dealing with the determination of money wages states that money wages are related to profits, productivity, price level, unemployment rate, union powers and so forth. A synthesis approach of a number of important complementary theories of wage determination is taken by Arestis and Mariscal (1995) who combine four theories of wage determination: income distribution (bargaining model), wage relatives (in the wage hierarchy), the efficiency wage model, and the hysteresis model[6]. These econometric approaches may have their own interpretative values in explaining the wage determination during a sample period of a particular country. Their wage functions, in most cases, are treated as an independent (single-equation) model or as part of a limited (wage) model, so that their interpretative values are restricted. Here, we consider money wages as a historical datum with the aim of modeling the social and historical setting.

3.1 Scenario behind the model

We begin by explaining the background to our *KK* economy. We assume an advanced capitalist economy in which oligopolistic price setting (markup pricing) is overwhelming. Investment is a *strategic factor* in the model setting and affects the real output (μL), but money wages do not in

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microeconomic framework." Second, "the theoretical literature on union wage models suffers from other conceptual shortcomings" (quite fragile, highly abstract and superficial models, and a competitively determined wage in nonunion labour market). The third is "methodological problems" (highly fragmented and particularistic theoretical work, too narrowly conceived and being divorced from real-world contact with unions and the process of collective bargaining). (ibid., pp. 146-148).

6) See also Arestis and Mariscal (1997) for the determination of wages, unemployment and labour productivity in the UK. Rowthorn constructs a 'conflict' model, in which "Power plays a central role on the determination of wages and prices" (1977, p. 236). See Burdekin and Burkett (1996) for the 'conflict inflation' approach.

an ordinary case. After analyzing the possible effects of changing wages on both investment and consumption, Davidson concludes that "the demand for labor curve is likely to be almost vertical (if not completely inelastic) through most of its relevant range" in the money wage / employment space (1994, p. 189)[7]. Post Keynesians consider that "the aggregate level of the money wage can essentially be considered a historical datum, serving as the calculable starting point for actual bargaining between workers and employers" (Seccareccia, 2003, p. 383). Actual bargaining is influenced by various factors such as customary practices, social norms, and wage structures across sectors[8]. As we will see later, in the real world, the change of money wages has an effect on a variety of variables, in particular those related to income distribution.

In addition to our starting assumptions (*i-iv*), the scenario is developed based on the following auxiliary assumptions that:

v. The money wage contract lasts for one term;

vi. The markup price is set, provided that the firm is working at the normal operation rate of capacity, and this price does not change through the term;[9] and

vii. The wage contract is normally made in terms of money wages, and the objective of the trade union is to maintain or increase the level of the real wage in the bargaining with employers.

For the following scenario, we show some important variables obtained from our *KK* model. First, an investment-saving equilibrium condition is obtained from equations (2) and (3) as:

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7)　For a similar argument, see King (2001, pp. 70-1).

8)　For a realistic treatment Seccareccia (2003, pp. 382-3) introduces the works of Applebaum (1979) and Grimshaw and Rubery (1998), discussing the dual wage structure that is formed by the segmented labour market between the primary and the secondary markets. Ishikawa (1991, chs. 5 and 6) and Ishikawa and Dejima (1994) deal with this matter and demonstrate the validity of this approach in Japan. Yoshikawa (1992, ch. 3) presents a segmented labour market macro-model and discusses its validity in the Japanese labour market. However, we do not take account of this matter in the present paper.

9)　For the price rigidity refer to Lee (1994) for the US and the UK, and Fuchi and Watanabe (2001) for Japan and a cross-country comparison (among G7 countries).

$$I=s_w W+s_p P. \tag{2a}$$

An equilibrium condition for supply price is expressed by equation (4)

$$Y=W+r(W+D) \tag{4}$$

where r is expressed in gross terms. Putting equations (1), (7), and (8) into this, we have profits, P

$$P=r(wL+edK),\ \partial P/\partial r,\ \partial P/\partial w,\ \partial P/\partial L,\ \partial P/\partial e > 0 \quad for\ L < L_{fk}, \tag{9}$$

where we assume $L_{fk} < L_f$. Putting (9) into (2a), after some arrangement we have the employed labour force, L

$$L=\frac{(I/e)-s_p r(dK)}{(w/e)(s_p r+s_w)},\ \partial L/\partial(I/e)>0 \quad for\ (I/e)-s_p r(dK)>0. \tag{10}$$

Next, labour productivity is expressed by equation (5) as:

$$\mu=f(L) \quad \partial\mu/\partial L>0 \quad for\ L \leq L_{fk}. \tag{5}$$

The unemployment rate (u) is defined as:

$$u \equiv (L_f-L)/L_f \quad \partial u/\partial L<0 \quad for\ L < L_f. \tag{11}$$

Finally, the price level is obtained by using equations (4), (6), (7), and (8) as:

$$e=\frac{(1+r)w}{\mu-(dKr/L)} \quad \partial e/\partial w > 0 \quad for\ L \leq L_{fk}. \tag{12}$$

Considering assumption *vi,* the price equation (12) is expressed as:

$$e=\frac{(1+r^*)w}{\mu^*-(dKr^*/L^*)} \tag{12a}$$

where the asterisk denotes the value at the normal operating rate of capacity. We now have one sticky price term using this equation (12a). As a result, the actual *markup rate* (r) becomes an endogenous variable, which is obtained from equation (12) as:

$$r=\frac{(e/w)\,\mu-1}{1+(e/w)(dK/L)} \quad \partial r/\partial\mu,\ \partial r/\partial L > 0. \tag{12b}$$

Money wages and the markup price are maintained for a term, so that the actual markup rate changes in accordance with the changes of actual productivity and employment.

The capital stock, the labour force, and the technical conditions are given at a starting point, and the money wage rate is given as a historical datum. A firm organises its business based on these given conditions, which decide the necessary volume of employment. Then, productivity

per head will be determined and the supply price will be given by the markup, provided that the firm is working at the normal operation rate of capacity. The firm's variables can be aggregated as a weighted average in the whole economy, respectively.

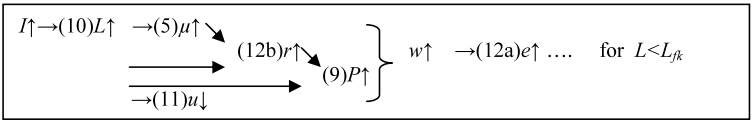
Next, consider the effect of an increase in investment under the state of the unemployment economy. The investment increase causes an increase of employment (10), which brings increases in productivity (5), markup rate (12b) and profits (9), and the decrease in the unemployment rate (11), where the number in parentheses indicates the related equation. The state of these variables will affect an increase of money wages in the next term.

Third, an increase of money wages brings a price increase under the same technical condition[10]. From equation (12a), we have the same ratio of (e/w) in this case, because variables denoted with an asterisk do not change except for L^*. Reflecting an increase of K, L^* increases but K/L^* will remain the same as that in the preceding term. If the volume of investment in real terms is kept above the level of the previous term, both the markup rate and profits also increase. Reflecting the type of technical progress in the real world, there will be various possibilities for the changes in price, markup rate, and profits. Figure 1 explains the scenario simply using a flowchart.

When full employment is attained, a further increase of investment will not cause any further increase of employment, and as such, labour productivity and the unemployment rate cease to change. In this situation, the assumption that the price level continues to the next term is untenable. Contrary to our assumption, the price level will increase during the term, which exerts strong pressure to bring about a wage hike. The planned investment will not be completed in real terms. In such a case the demand side becomes more influential in the price change than the

10)　For equation (10), we have assumed s_p, s_w, d, and K as given. Under the same technical condition, the real wage rate (w/e) is constant, so that there is no direct effect of the money wage rate on the labour force employed. If the investment in real terms decreases because of the high price increase caused by the high wage increase, this will affect the volume of employment.

Figure 1 Causation flowchart of investment
An increase of investment



Note: If investment is kept to increase after $w\uparrow$ in the next term, the same process continues as in the preceding term. Considering the technical change, there will be various possibilities of the change in variables (e, r, and P).

markup pricing. Hence, the investment increase may result in both price and money wage increases[11].

W can also develop the scenario of the decrease of investment to depict a reverse course.

3.2 Completion of the model

Here we deal with some variables for a more realistic explanation of the money wage rate in the long run, where we need to take into account the growth of the labour force, and productivity growth that reflects technical progress. These factors will not only strengthen or alleviate the causation above but also produce second-round effects[12].

Taking *the growth of the labour force* into account, the unemployment rate equation (11) is specified as:

$$u \equiv (L_f - L)/L_f$$
$$\partial u/\partial L < 0 \text{ for } l_f < l \text{ and } L < L_f; \partial u/\partial L \geq 0 \text{ for } l_f \geq l \text{ and } L < L_f \qquad (11)$$

where l_f and l show the respective growth rate of L_f and L.

In the money wage bargain, the relative share of income between profits and money wages is an important factor, particularly under inflation, which reflects the actual markup rate r and profits P. Inflation is "a

11) Dealing with this situation is probably best dealt with in a separate paper.
12) Dealing with technical progress means the specification of production-employment function (5) in this model; however, the question is not our aim of this paper. See Iyoda and Matthews (2001) for this.

symptom of a fight over the distribution of current income" (Davidson, 1994, p. 149). The trade union is keen on maintaining or increasing the real wage rate (w_r) in the bargain with employers (assumption *vii*). The real wage rate is defined as:

$$w_r \equiv w/e. \tag{13}$$

From equation (1) and using (6) and (7), the money wage rate is given as:

$$w = e\mu - \pi \tag{1a}$$

$$\partial w/\partial e,\ \partial w/\partial \mu > 0,\ \partial w/\partial \pi < 0 \ (\text{or } \partial w/\partial P < 0,\ \partial w/\partial L > 0)$$

where

$$\pi \equiv P/L \tag{14}$$

(π = per capita profits). From equation (1a), we infer that variables on the right side relate to the determination of money wages. Since money wages lag behind one term in our model, we take productivity, per capita profits, the unemployment rate (as proxy for the labour force employed), and the price level in the preceding quarter[13]. Money wages in the preceding quarter themselves are a starting base for bargaining. This treatment corresponds to the interpretation that the Japanese spring wage offensive "functioned as a system for distributing the previous year's increase of *GNP* to the workers" (Nakamura, 1995, p. 116) against the background of a labour shortage. Equation (15) describes the money wage function:

$$w_t = f(w_{t-1}, \mu_{t-1}, \pi_{t-1}, u_{t-1}, e_{t-1}) \tag{15}$$

$$f'_{w(t-1)},\ f'_{\mu(t-1)},\ f'_{e(t-1)} > 0,\ f'_{\pi(t-1)} < 0, \text{ and } f'_{u(t-1)} < 0.$$

We now complete an **expanded model** that deals with the money wage rate as an endogenous variable. The markup rate is also dealt with as a partly endogenous variable. The subscript *t* (period) is omitted where it does not cause ambiguity. The model now consists of 13 equations:

Equations (1)-(8) in the Basic Model

$$u \equiv (L_f - L)/L_f \tag{11}$$

$$e = \frac{(1+r^*)w}{\mu^* - (dKr^*/L^*)} \tag{12a}$$

13)　Here we take u_{t-1} as proxy for L_{t-1}. See the next section for the argument between these variables.

$$w_r \equiv w/e \tag{13}$$

$$\pi \equiv P/L \tag{14}$$

$$w_t = f(w_{t-1}, \mu_{t-1}, \pi_{t-1}, u_{t-1}, e_{t-1}) \tag{15}$$

The relationship is articulated as follows.

15 given variables $I, s_w, s_p, d, K, L_f, L_{fk}, r^*, \mu^*, L^*, w_{t-1}, \mu_{t-1}, \pi_{t-1}, u_{t-1}$, and e_{t-1}.

13 unknown variables $Y, W, P, S, L, \mu, e, D, u, \boldsymbol{r}, w_r, \boldsymbol{w}$, and π.

13 equations (1)-(8), (11), (12a), and (13)-(15).

Unknown variables worthy of attention are printed in bold.

4. A Money Wage Function and Estimated Results

4.1 A behavioral function for empirical studies[14]

In this section, we deal with the empirical form of the money wage function. In applying function (15) to an individual economy or to a longer period, however, we need to consider elements that reflect the historical, institutional, and social factors of Japan. The change in these factors, particularly the institutional factor, produces an important effect on the determination of money wages. Some of the ingredients (variables) may have a very weak effect on the money wages in an individual case (in terms of period or country)[15]. The following explains some important properties of the Japanese economy.

First are properties obtained by observation of time series data. Figure 2 shows the quarterly time series data of Japan for the period 1970-2001. In Figure 2(a), we observe a steep decreasing trend of the profit/wage ratio in the first half of the 1970s. We see an increasing trend of the *GNP* deflator until early 1990s, and in particular, very sharp rises in 1973 (12.5 percent) and 1974 (20.8 percent). We also observe a gradually increasing unemployment rate from 1970 (1.1 percent) to 2001

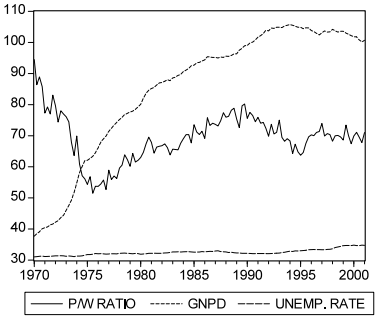
14) See Iyoda and Matthews (2001; 2002) for two dynamic functions (a markup rate and the productivity-employment functions), which relate to equations (4) and (5), respectively. These functions, which are tested by annual data, may require further examination.

15) See Shimizu (1993a, 1993b), for example. In application of Boyer's (1978) idea to postwar Japan, he divided the years from 1956 to 1989 into three periods (1956-64, 1965-74, and 1975-89) and formed empirical wage functions for each period.

(5.0 percent). In Figure 2(b), we have productivity and money wages, both of which show an increasing trend until the mid-1990s. Money wages are almost in parallel with productivity at constant prices.

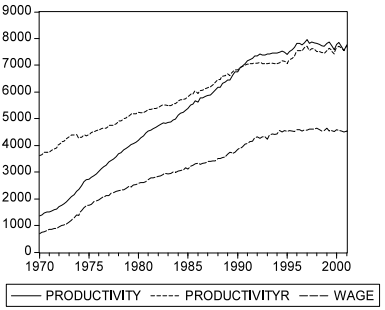
Figure 2 Time series data

(a) Profit/wage ratio, *GNP* deflator and unemployment rate



note: p/w ratio (profit/wage ratio in %)
GNPD (*GNP* deflator, 1990=100)
unemployment rate (rate in Fig. less 30)

(b) Productivity and wages



note: productivity (nominal productivity)
productivityr (productivity at 1990 prices)
wage (money wages)
unit: thousand yen

Triggered by the first oil shock in 1973, Japan experienced an extraordinarily high rate of inflation for the years 1973-1974, followed by the most serious depression in the postwar period. After the mid-1970s, despite a second oil shock in 1979, Japan had stable economic growth until 1991; the average annual growth rate was 4.3 percent for the years 1976-1991. However, the bubble economy then burst. From 1992 onward, the Japanese economy gradually fell into stagnation and entered into a long, hard struggle toward economic revival until 2001. The time series data reflect some of these facts well, suggesting a significant structural change occurred in the mid-1970s.

A second important factor is the spring labour offensive, the *shunto*, which is the unique institutionalised process where each spring Japanese labour unions bargain in concert with employers for annual wage increases. Spring is an appropriate time for wage bargaining in Japan because the fiscal and the school years begin on April 1. In April, many

companies recruit new workers, set up entry-level wages, and make adjustments in wage scales. The first *shunto* started in 1955 and "functioned as a system for distributing the previous year's increase in GNP to the workers" against the background of a labour shortage. After the first oil shock, however, the *shunto*'s pattern of wage setting and its influence over the whole economy greatly changed, and the difference in wage increases between the *shunto* and the non-*shunto* sectors increased, where the non-*shunto* sector consisted mostly of small and medium-sized companies. Reflecting changes in both the *shunto* bargaining pattern and institutional backgrounds, the Japanese spring offensive gradually waned toward the end of the 1990s (see Appendix A for details). The labour share (or the profit share) reflects these changes.

The third important factor is the treatment of the labour force variables. The Japanese literature has mostly suggested that the rate of unemployment is not sensitive enough to represent economic fluctuations in Japan[16]. Hence, we consider the labour force employed instead of the unemployment rate. Note our assumption *iv* and flowchart (Figure 1). Equation (15) suggests that wages are a function of their value 1 period ago; productivity, per capita profits, unemployment rate, and prices are from the previous period. Taking (15), making a log linear approximation, and replacing u_{t-1} by L_{t-1}, we have:

$$\ln w_t = b_1 + b_2 \ln w_{t-1} + b_3 \ln \mu_{t-1} + b_4 \ln \pi_{t-1} + b_5 \ln L_{t-1} + b_6 \ln e_{t-1} + \varepsilon_t \tag{15a}$$

where, $b_2, b_3, b_5, b_6 > 0$, $b_4 < 0$, and ε_t = error term.

Fourth is the introduction of a four-term moving average for some variables on the right side of the equation. Japanese conventional facts suggest this treatment. Money wages are, in general, a year contract starting from the second quarter term and the per capita profits will be influenced by this contract. Employees' wage earning includes biannual bonuses based on company profits given in June-July and December, which add up, on average, to the equivalent of 3-5 months' regular pay.

16) See Yoshikawa (1992, pp. 136-137), for example. In my estimate, the results with the unemployment rate were poor, in particular with a low t-value (-1.12) of π.

The bonus system contributes to flexible wage adjustment (see Itoh, 1992, pp. 231-39 for an explanation of the bonus system). Any change of the labour force will not be smooth, because most Japanese employees are recruited immediately after graduation at the start of the second quarter term of the year[17].

We obtain w (money wage rate), π (per capita profits), and μ (labour productivity) by W/L, P/L, and Y_r/L, respectively ($Y_r = GNP$ at constant prices). See Appendix C for data.

4.2 Estimated results

The results are set out below. Estimating equation (15a) for the case of Japan, we have:

$$\begin{aligned}\ln w = &-6.9714 + 0.3889 \ln wm_{(-1)} + 0.5745 \ln \mu_{(-1)} - 0.6727\, Du \ln \mu_{(-1)} - 0.1415 \ln \pi m_{(-1)} \\ &\quad (-5.68) \qquad (4.90) \qquad (4.45) \qquad (-9.25) \qquad (-2.32) \\ &+ 0.8280\, Du \ln \pi m_{(-1)} + 0.4984 \ln Lm_{(-1)} + 0.5641 \ln e_{(-1)} \\ &\quad (9.34) \qquad (4.52) \qquad (3.89) \\ \bar{R}^2 = 0.9993 \quad &LM = 0.52 \text{ (p-value} = 0.9720, \text{ value in 4 lags)} \\ &= 2.86 \text{ (p-value} = 0.8267, \text{ value in 6 lags)}\end{aligned} \tag{15a}$$

for the sample period (adjusted) 1971:2-2001:1 (120 observations after adjustments, 't' values in parentheses); Du (dummy) 1 = (1970:1-1974:4), 0 = (1975:1-2001:1). The suffix m indicates the four quarterly moving average.

The results satisfy conventional criteria: the stability test[18] and the Breusch-Godfrey serial correlation LM (Lagrange multiplier) test. The sign of the partial (regression) coefficient of πm_{t-1} was positive for the period of 1971:2-1974:4, probably reflecting militant union's strategies in the *shunto*. However, it was negative for the period of 1975:1-2001:1,

17)　We conducted two types of unit root tests–the Phillips-Perron (PP; 1988) test and the Kwiatkowski-Phillips-Schmitt-Shin (*KPSS*; 1992) test–to examine the time series property of the variables. As a result, it turned out that the data did not have serious problems. See Appendix B for the detailed test results.

18)　The results of the CUSUM (sum of recursive residuals) and the CUSUM of squares (sum of recursive-squared residuals) tests are within the 5% significance bands.

reflecting the dramatically changed strategies of the moderate unions and changes in institutional backgrounds. The profit/wage ratio of Figure 2(a) might represent those changes[19]. The Breusch-Godfrey serial correlation *LM* test indicates that there will be no significant serial correlation. The coefficients are statistically significant for conventional criteria and are correctly assigned according to our theoretical priors except for the dummy period.

Table 1 shows short-run and long-run effects, and elasticity. From these values we see the properties of the explanatory variables. The value in the long-run effect represents the magnitude of the effect on wages in the long run. The most decisive factor was productivity, and the price increase follows. In terms of elasticity, however, the price increase is the most decisive, followed by productivity. Note that productivity is expressed in real terms. During the dummy period, the values of per capita profits in both the long-run effect and elasticity were positive and large, and those values of productivity were negative. These may be explained as follows. During the first half of the 1970s, the labour offensive became militant toward the money wage increase under the extremely high rate of inflation. As a result, there was a strong increasing trend of the labour share (or a decreasing trend of the profit share). After the mid-1970s, the labour share conversely showed a gradual decreasing trend until 1990, reflecting a weakening in the unions' bargaining power and a rebalancing of this power. See Appendix D for the estimated results of the money wage function dealing with the relative share matter.

The result of the estimate also suggests that, since the money wage coefficient $\ln wm_{(-1)}$ is 0.3889, the adjustment speed is fairly fast, taking 2.4 periods for 90 percent adjustment and 3.2 periods for 95 percent adjustment. This may be caused in part by the *shunto* and the biannual bonus system (and note a strong increasing trend of the percentages of low-

19) The result of the period of 1971:2-1974:4 may suggest that either our markup pricing does not hold true under the high rate of inflation or the price adjustment is quicker than the normal case. This needs special attention.

wage part-timers in the total labour force). We may conclude that our empirical function of the money wage rate has a good interpretative value.

Table 1
Short-run effect, long-run effect, and elasticity

Variables	coefficient	long run effect	elasticity
$\ln \mu_{(-1)}$	0.5745	0.9401	0.6266
(Du period)	-0.0982	-0.1607	-0.1171
$\ln \pi m_{(-1)}$	-0.1415	-0.2315	-0.1349
(Du period)	0.6865	1.1234	0.6747
$\ln Lm_{(-1)}$	0.4984	0.8156	0.2765
$\ln e_{(-1)}$	0.5641	0.9231	0.7797

Note: The suffix m indicates the four quarterly moving average of the variable.

5. Conclusions

The paper sought to explain the determination of money wages in the Post Keynesian spirit. Based on a basic *Kalecki-type Kaldorian* (*KK*) model, we constructed a model of the endogenous determination of money wages that reflects Post Keynesian understanding. We transformed the money wage function to an empirical basis and tested its empirical validity for the case of Japan. The results satisfied conventional statistical tests and gave a satisfactory explanation of the determinants of the money wage. All related values were significantly related to the determinants of money wages. Except for productivity, data are in nominal terms in a monetary production economy. The results of the test suggest that our approach has a good interpretative value both theoretically and empirically. However, the significance of this paper is limited because only one important function is tested, and a test of the whole system remains to be done.

We mention two points of note in relation to this paper. First are the properties of the empirical function. The changes of institutional factors and economic structure may have an important effect on economic

variables, in particular, those in the labour market. An important question is the extent to which empirical functions perhaps vary from time to time in the long run and from country to country. Second is the need for empirical study. We consider that a model in the economic sciences must, on the one hand, satisfy logical consistency, and as long as it is possible, should be tested through empirical studies, on the other. This paper is a first step towards addressing this challenge.

Appendix A: Structural Changes (background to the *shunto* system)

A considerable body of literature has accumulated on wage functions, in particular on the negotiated wage increases in Japan (see Ministry of Labour, 1975, p. 195, and Shimizu, 1993a, 1993b, for example). After the first oil crisis in 1973, however, we need to consider the following changes.

Changes in *shunto* bargaining pattern: After the first oil crisis of 1973, the Japanese economy fell into the most severe depression of the postwar period. Since then, the pattern of wage setting has dramatically changed "as unions moderated their strategies toward harmonization with economic rationality" (Koshiro, 2000, p. 161). There was "a tacit understanding between firms and the labour unions that in times of recession the firm will not specify individual employees to be fired" (Nakamura, 1995, p. 218). Compared with other industrialised countries, the speed of employment adjustment was slow (see Shinotsuka and Ishihara, 1977). The unions put the self-imposed restraint on wage increases on the assumption that this would maintain employment levels as much as possible, and the employers trimmed the total costs by shifting from using full-time workers to part-time or temporary workers. As a result, part-timers comprised 2.9 percent of the total labour force in 1975, which rose to 8.6 percent in 1985, 14.5 percent in 1995, and 22.1 percent in 2002 (source: Ministry of Health, Labour and Welfare, *Annual Report of the Monthly Labour Survey*).

Changes in institutional backgrounds: (a) Militant union groups had taken the initiative in the *shunto* until 1974; thereafter the wage setting

leadership was taken over by moderate IMF-JC (the International Metalworkers Federation-Japan Council) unions on behalf of the unions (see Koshiro, 2000, p. 114). (b) Some of the large and influential public corporations such as Nippon Telegraph and Telephone (1985) and National Railways (1987) were privatised during the 1980s (ibid., p. 168). (c) Following the introduction of the Temporary Workers Law (literally the Dispatch Workers Law) in 1986, the deregulation of the labour market has been gradually carried out (ibid., p. 168). (d) Union density was stable at around 35 percent in the 1960s, but has shown a decreasing trend from 1970 onwards (18.7 percent as of 2005) (source: Japan Statistical Association, *Historical Statistics of Japan, New Edition,* Vol. 4, T19-32). Furthermore, after the burst of the bubble economy in 1991, the Japanese economy stagnated until the early 2000s. As a result, the Japanese spring offensive gradually waned towards the end of 1990s.

Appendix B: Results of unit root tests

We conducted two types of unit root test: the Phillips-Perron (1988) test (*PP* test) and the Kwiatkowski-Phillips-Schmidt-Shin (1992) test (*KPSS* test). The *PP* test sets up the null hypotheses of a unit root, while the null hypothesis of the *KPSS* test is that a series is stationary. The test statistics are given in Table A. For $\ln\mu$, $\ln Lm$, and $\ln IY$, the null hypothe-

Table A
Results of unit root tests

	PP test		*KPSS test*	
Variable	(1)	(2)	(1)	(2)
$\ln w$	-8.065**	-3.369△	1.198**	0.283**
$\ln wm$	-7.862**	-3.253△	1.180**	0.274**
$\ln\mu$	-3.478	-1.057	1.326**	0.280**
$\ln\pi m$	-4.633**	0.403	1.231**	0.331**
$\ln e$	-5.679**	-1.719	1.097**	0.304**
$\ln Lm$	-1.267	-1.169*	1.298**	1.150*
$\ln IY$	-2.051	-2.727	0.897**	0.157*

Notes: 1. Column (1) includes a constant term. Column (2) includes a constant term and a deterministic time trend.

2. The suffix *m* indicates the four quarterly moving average of the variable.

3. (**), (*), and (△) mean rejection of a null hypothesis at the 1%, 5%, and 10% significance level, respectively. The critical values of *PP* test come from MacKinnon (1991), while those of the *KPSS* test come from in Kwiatowski *et al*. (1992, Table 1).

sis of a unit root is not rejected while the null hypothesis of stationarity is rejected.

Appendix C: Data

C.1 Data source abbreviation

ANA–*Annual Report on National Accounts,* Economic and Social Research Institute of Cabinet Office (ESRICO), Japan.

DS–Datastream (Thomson Financial) (as of 24 July 2002).

C.2 Data

68*SNA* (to *ANA*2000) and *GCS* (obtained as of February 2002).

93*SNA* (*ANA*2002, obtained as of July 2002).

National Accounts and Stock Data (except for *NFCS* for 1970-97) were downloaded from

(www.esri.cao.go.jp/jp/sna and www.esri.cao.go.jp/jp/sna/stock)

(1) National Accounts (based on 68*SNA*)

GNP and *GDFCF* (gross domestic fixed capital formation) for 1970:1-2001:1 (seasonally adjusted quarterly series):

at current prices (gaku-mk01168); at constant prices (benchmark year=1990, gaku-jk01168).

CE (compensation of employees), IPE_{inc} (income of private incorporated enterprises–before receipt and payment of dividends), IPE_{uninc} (income of private unincorporated enterprises–without imputed rent from owner-occupied dwellings), and T_c (corporate tax) for 1970q1-2001q1 (at current prices, seasonally adjusted quarterly series):

1970:1-99:1 from T2, 55QAM2N (*ANA*2000), and for 1999:2-2001:1 new values (90qam2n, *ANA* 2002) are adjusted by four-term average of the ratio of old value (*ANA*2000) to new value (*ANA* 2002) for 1998:2-99:1:

four-term average × new value.

(2) Stock

GCS_{inc} (gross capital stock of incorporated private enterprises), and GCS_{uninc} (gross capital stock of unincorporated private enterprises) for 1970:1-2001:1 (T1　Capital Stock by Industry-all industry-, progressive base):

1970:1-2000:1 from (0911stock, valued at 1990 average price), and for 2000:2-2001:1 are adjusted by four-term average of the ratio of 1990 benchmark value (0911stock) to1995 benchmark value (021stock2) for 1999:2-2000:1:

four-term average × new value.

(3) Others

L (total level of employment) and u (unemployment rate) for 1970:1-2001:1 (seasonally adjusted quarterly series):

DS.

(4) Values obtained from above national accounts and stock

GNPD (=*e*, *GNP* deflator) for 1970:1-2001:1 are obtained by the current/-constant prices.

W (wages) is obtained by

$W = CE + IPE_{uninc}\ (1- GCSR)$

where $GCSR = GCS_{uninc} / GCS_{inc}$ (gross capital stock ratio of unincorporated to incorporated enterprises).

P (gross profits) for 1970q1-2001q1 are obtained by

$P = Y(=GNP) - W$

w (money wage rate), π (per capita profits), and μ (labour productivity) are obtained by W/L, P/L, and Yr/L, respectively ($Yr = GNP$ at constant prices).

Appendix D: Result of the money wages estimate (with *I/Y* ratio)

According to the Kaldor's model ($P/Y = \{I/Y\,(s_p - s_w)\} - s_w/(s_p - s_w)$), the investment/output (I/Y) ratio, which is treated as an independent variable, plays a strategic role in determining the profit share (P/Y ratio) (see Iyoda, 1997, ch. 3). Estimating the money wage equation (15b) that has IY_{t-1} instead of π_{t-1}, we obtain:

$$\begin{aligned}\ln w = &-4.8676 - 2.7322\,Du + 0.5753\ln wm_{(-1)} + 0.2621\ln \mu_{(-1)} + 0.0548\ln IY_{(-1)}\\ &\quad(-4.44)\quad(-6.33)\quad(8.63)\quad(4.24)\quad(1.99)\\ &+ 0.2239\,Du\ln IY_{(-1)} + 0.4385\ln Lm_{(-1)} + 0.2304\ln e_{(-1)} + 0.4815\,Du\ln e_{(-1)} \qquad (15b')\\ &\quad(1.85)\quad(-3.46)\quad(4.29)\quad(9.22)\\ \bar{R}^2 = 0.9993 \quad &LM = 1.88 \text{ (p-value} = 0.7582, \text{ value in 4 lags)}\\ &= 3.20 \text{ (p-value} = 0.7830, \text{ value in 6 lags)}\end{aligned}$$

for the sample period (adjusted) 1971:2-2001:1 (120 observations after adjustments, 't' values in parentheses; *Du* (dummy) 1 = (1970:1-1974:4), 0 = (1975:1-2001:1). *IY* is the investment/output ratio obtained by *GDFCF/GNP*.

The results satisfy conventional criteria: the stability test and the Breusch-Godfrey serial correlation *LM* test. The coefficients are statistically significant and correctly assigned according to our theoretical priors.

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