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Toward the rebuilding of modern macroeconomic theory: Market failure and Keynes' unemployment equilibrium

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This study gets the following two conclusions: First, in a macroeconomy, market failure occurs because the price mechanism does not function, especially under deflation. Consequently, even if nominal values are sufficiently flexible, steady-state and thus full employment equilibrium do not hold. In other words, there is no macro general equilibrium corresponding to a micro general equilibrium. Market failure in a short-run macroeconomy is because of the unavoidable spillover effects, or the derived demand effects between goods and labor markets under disequilibrium from rigid wages and prices. Market failure would occur even in the long-term macroeconomy as an inevitable conjecture from the short-run analysis. For the above analyses, a static model is sufficient, and dynamic models are unnecessary and theoretically unfeasible.

Second, Keynes' unemployment equilibrium is realized owing to market failure in a macroeconomy. It shows that involuntary unemployment results from quantitative and not price aspects. In other words, the unemployment results from shortage in labor demand under rigid real wages and not under rigidity of real wages.

Final section shows three novel proposals for future contributions of this study's implications.

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Keywords: disequilibrium; derived demand effects; market failure; Keynes' unemployment equilibrium; the role of aggregate demand
JEL classification: E12, E24, J23

1 Introduction

1.1 Motivation and objective of the study

In the standard of modern macroeconomics, new Keynesian dynamic stochastic general equilibrium (DSGE) models state the following: when nominal values are sufficiently flexible, the economy realizes full employment equilibrium. Hence, this proposition questions the long-term stagnation experienced by the Japanese economy since the 1990s and the United States and European economy following the 2008 financial crisis, because this proposition has an unacceptable unreality that under any severe recession, an economy achieves full employment equilibrium as deflation worsens or the rate of inflation falls consistently. This unacceptable unreality is the starting point of this study, and the next section explains the foundations of its unreality. This unreality arises because a macro price mechanism, which assumes that the micro price mechanism operates even in a macroeconomy, is a fallacy of composition, as proven in section 3. Here is the foundation that macroeconomics has a different theoretical paradigm than microeconomics.

This study challenges modern macroeconomic theories on price mechanism and unemployment based on the skepticism toward existing theories based on the observations of the real economy.

1.2 Study results and analytical approaches

This study presents three findings. First, the price mechanism does not function, particularly under deflation in the short-run macroeconomy, and thus leads to market failure. Second, as an inevitable conjecture based on the short-term analysis, market failure in the macroeconomy would persist in the long term. Third, market failure, as a result, leads to Keynes' unemployment equilibrium.

From the first two points, market failure in a macroeconomy, that is, the price mechanism in a macroeconomy is significantly incomplete and does not function, particularly under

deflation. As a result, even if nominal values are sufficiently flexible, steady-state and thus full employment equilibrium do not hold.

In the mainstream new Keynesian DSGE theory, long-run steady-state equilibrium is defined as the absence of serial correlation in disturbances; however, the state is only a definition of steady-state and does not imply the existence of long-run steady-state equilibrium; indeed, there is not anywhere a proof of the existence of such an equilibrium. In short, there is no macro general equilibrium corresponding to a micro general equilibrium.

As long as the macro price mechanism which the mainstream believes is not denied, any criticism of the mainstream and analyses of Keynes' equilibrium based on other models that the mainstream never recognizes cannot influence them. In this sense, this contribution is an innovative result that questions and challenges the standard and prevalent macroeconomic theories and thus provides a clue to rebuild the existing system.

The decisive cause of market failure in the short-run is the unavoidable spillover effects, or derived demand effects between goods and labor markets under disequilibrium from rigid wages and prices. These effects have already been analyzed by "quantity constraint models" in the studies by Malinvaud (1977), Benassy (1977), and Negishi (1979). However, the goal was to establish the micro theoretical foundations of Keynesian economics, but it could not be accomplished. Market failure itself has not been analyzed at all. However, quantity constraint models, which were neglected for a long time after the 1980s, now resurface as viable models for challenging the validity of the macro price mechanism. This study first obtains an innovative result of market failure in a short-run macroeconomy using Negishi's quantity constraint model, which is a simplified version of Benassy's model.

The first point is analyzed as follows, based on the derived demand effects under disequilibrium such as explained later. When macro goods and labor markets are in excess supply in the short-run, it is theoretically and empirically impossible for wages, prices, and

real wages to be sufficiently flexible to achieve soon the Walrasian general equilibrium, and thus full employment. Therefore, general excess supply persists under short-run rigid wages and prices; consequently, spillover or derived demand effects emerge between the goods and labor markets, as shown later. In the goods market, a lack of demand at current prices prevents firms from making optimal sales. Accordingly, supply constraints prevent firms from selling more than the actual demand. Therefore, firms must make dual decisions about effective labor demand in the labor market. These dual decisions reflect the derived demand effects in that the lack of demand for goods affects the labor demand. However, in the labor market, workers are unable to supply optimal labor due to a lack of demand at current wages. As a result of these supply constraints, they cannot accrue optimum wage income; they must make dual decisions to achieve effective demand for goods in the goods market, considering these income constraints. These dual decisions also demonstrate derived demand effects as a lack of labor demand affects the demand for goods.

"Derived demand effects" coined by the author are never an assumption as the effects correspond to an empirical foundation of the spillover effects in disequilibrium and no one can dispute them. Conversely, the presumption that both markets are independent and that the derived demand effects under disequilibrium are overlooked is entirely based on the aforementioned arbitrary assumption that the micro price mechanism operates even in a macroeconomy. Consequently, the abovementioned unrealistic price mechanism - a fallacy of composition - occurs.

Considering these derived demand effects unavoidable under disequilibrium, the Walrasian general equilibrium and consequently full employment equilibrium cannot be achieved even if wages, prices, and real wages are sufficiently flexible. Thus, market failure occurs in a short-run macroeconomy. (See §3.3 based on §3.2.)

As an inevitable conjecture from the short-run analysis, the second point would hold:

market failure would occur even in a long-run macroeconomy with flexible wages, prices, and capital rental prices, because unavoidable spillover effects, or derived demand effects arise among goods, labor, and capital markets under long-run disequilibrium. The late Keynesian professor James Tobin termed a steady-state equilibrium which the mainstream insists, "Never Land," indicating a destination that can never be reached. Indeed, there is no a proof of the existence of long-run steady-state equilibrium, as stated earlier.

For the analyses of the first and second points, a static model is sufficient, and dynamic models are unnecessary and theoretically unfeasible.

As long as the price mechanism does not function in a macroeconomy, particularly in times of deflation, the Walrasian general equilibrium is not established; thus, the optimal condition of the economy is not realized. Therefore, supposing wage, price, and real-wage flexibility is illogical. As a result, the cause of unemployment is not attributed to real-wage rigidity, as stated by the new Keynesianism.

Eventually, the third point holds: market failure in the macroeconomy leads to Keynes' unemployment equilibrium. The cause of involuntary unemployment lies in not price but quantitative aspects. In other words, the unemployment results from a shortage in labor demand under rigid real wages and not from real-wage rigidity.

This result becomes possible by improving and reinterpreting Shapiro and Stiglitz's (1984) efficiency wage model, which explains real-wage inflexibility. Thus, developing a new model to justify this result is not always necessary. The notions on the analytical approaches to the first and third points explicated above are already stated in Kawai (2014).[1]

Although this study analyzes involuntary unemployment, frictional unemployment depends on involuntary unemployment as it also depends on the labor demand. Thus, full employment is the level of employment at which there is only frictional and no involuntary unemployment.

1.3 Construction of the paper

Section 2 empirically criticizes existing theories of price mechanism and unemployment based on the persistent stagnation of the Japanese economy and the corresponding experiences of the US and Europe. Section 3 first surveys quantity constraint models and analyzes market failure in the short-term macroeconomy based on one of the models. Section 4 conjectures market failure even in the long term and reviews the long-term validity of the natural rate hypothesis. Section 5 elucidates Keynes' unemployment equilibrium. Section 6 considers aggregate demand as a crucial factor even in the long term. Furthermore, future contributions of this study's implications are proposed.

2 Empirical criticisms of prevailing theories

After the 1990s, the Japanese economy faced long-term stagnation, and more recently, the US and Europe faced a similar situation. Therefore, this study empirically criticizes the proposition that short-run equilibrium is established when nominal values are inflexible and in the long term, steady state and therefore full employment equilibrium occurs when nominal values are sufficiently flexible.

2.1 The vital question in the new Keynesian DSGE theories

The key question arises that if this proposition is true, then why is the Japanese economy experiencing persistent sluggishness with high unemployment for over 10 years since the crisis in 1990. It is proposed that even during severe recession and excess supply of goods and labor, such an influence is temporary. The proposition holds that in the short term, reduced prices and real wages will lead to economic recovery, which in turn will lead to long-term or full employment equilibrium.

Figure 1 illustrates the proposition using a dynamic aggregate demand–aggregate supply (AD–AS) model. Figure 1(a) represents a convergence to a long-term equilibrium in the Japanese goods market under deflation. Even if the state of the economy is much below the full employment level, Y_F, it reaches long-term equilibrium E^W through downward shifts of the dynamic AS curves because of the fall in the expected rate of inflation. Considering that the GDP or income increases as deflation worsens, an economy under deflation will reach the full employment equilibrium. However, Japan has witnessed a contrasting scenario (Yoshikawa 2000), challenging the empirical and theoretical validity of the proposition. This unreality is a result of the model consisting of goods market alone, and ignoring the spillover effects, or derived demand effects among some markets, including those under disequilibrium. This neglect is based on the arbitrary supposition stated earlier. The following subsection explains the real scenario in Japan, which is in contrast to the proposition.

[Figure 1 near here]

2.2 Unreality of a macro price mechanism

After 1998, when Japan's consumer price index, besides energy and food other than alcoholic liquors, began to decline, the index continued to decline through 2012 except 2008. Moreover, Japan's GDP deflator, which is equal to the economic overall price index, continued to decline up to 2012, again except in 2008 (Figure 2). Nevertheless, the gap in GDP persisted from 1998 to 2012, except in 2007, and the Japanese economy never reached a long-term equilibrium as claimed by the proposition (Figure 3).

[Figure 2 near here]

[Figure 3 near here]

Furthermore, in Japan, the "deflation spiral" was marked by a vicious circle of deflation and depression during 1998–2002. Decline in general prices hampered businesses in terms of both sales and profits, which in turn controlled wages and employment and decreased households' consumption demand. This impediment to business results affected decisions on equipment and households' housing investments. Consequently, the demand for overall investment declined. Moreover, when firms or individuals could not repay their debts, banks cautioned about new loans owing to increase in bad debts, which further decreased investment and consumption demand from the finance perspective. Therefore, the economy experiences a vicious circle where deflation decreases aggregate demand and deepens the depression, which in turn aggravates deflation.

The failure of this proposition is not only evident in and specific to the Japanese economy after the 1990s but also applies to the economic depression experienced in other developed countries and their subsequent economic stagnation, starting with the autumn 2008 US financial crisis and the 1930s' Great Depression. Figure 1(b) indicates a convergence process to long-run equilibrium in usual goods market or the market in the US and Europe. Specifically, because GDP or income increases as the rate of inflation decreases, the economy reaches full employment equilibrium, which contradicts the experience of the US and Europe, indicating this proposition's divergence from reality. In fact, persistent decline in the rate of inflation leads to deflation in an economy across countries, such as the US, Europe, and Japan.

3 The price mechanism does not function, particularly under deflation: Market failure in the short-run macroeconomy

3.1 Inevitable questioning of the validity of the price mechanism

This section deconstructs the validity of the price mechanism in the short-run macroeconomy.

Before doing so, this study examines studies claiming that the economy becomes unstable when prices are sufficiently elastic. These studies have the following drawbacks: any results that prove this proposition are derived from the models different from the neoclassical models that claim the existence of a perfect price mechanism. Because the neoclassical model does not accept the validity of other models, any such result cannot influence neoclassical thought.[2]

The present study claims it is impossible to examine the validity of the price mechanism unless it is examined using the same framework as in neoclassical economics. Specifically, this study challenges the Walrasian general equilibrium's assumption of flexibility of wages and prices, proposed by the neoclassical macro theory. For that purpose, this study focuses on the "quantity constraint models." Specifically, the quantity constraint models of Benassy and Negish are used to show an innovative result that the price mechanism is significantly incomplete and inoperable in the short-run macroeconomy, particularly under deflation. As explained in subsection 1.2, this study focuses on the spillover effects, or derived demand effects under disequilibrium, which is neglected by modern macroeconomics. This study does not require dynamic analysis; moreover, the spillover effects under disequilibrium cannot be analyzed using dynamic analysis.

3.2 Quantity constraint models for disequilibrium analysis

Quantity constraint models have attracted academic attention as micro theoretical foundations of Keynesian economics in the 1970s. However, their popularity declined in the early 1980s because these models could not be established as the micro theory of Keynesian equilibrium. However, a general disequilibrium theory using the quantity constraint models forms the foundation of this study's analyses on the incompleteness of the price mechanism in the macroeconomy. In short, although the quantity constraint models do not analyze market failure itself at all, they contribute to its analyses. Therefore, this subsection surveys the

quantity constraint models focusing on Negishi's model which simplified Benassy's model.

The premise of quantity constraint models is that wages and prices are assumed to be constant because price adjustments occur at a much slower rate than quantity adjustments and are therefore beyond the scope of short-run models. Indeed, the assumption of short-run rigidity of wages and prices is more valid than that of flexibility in modern macroeconomics. The quantity constraint models were pioneered by Patinkin (1964) and Clower (1965). Patinkin and Clower analyzed the behaviours of firms that face excess supply in the goods market and the ones of workers that face excess supply in the labor market respectively. Benassy (1975, 1977) combined the results of Patinkin (1964) and Clower (1965), and developed a general disequilibrium model of income and employment that examines the spillover effects, or derived demand effects between both the markets with excess supply or excess demand or different states.

First, this study focuses on the criticism that quantity constraint is incompatible with the assumption of a price taker under perfect competition, followed by an explanation of quantity constraint models. Arrow (1959) indicated that when a competitive market encounters excess supply, a competitive supplier is not a price taker facing a horizontal demand curve but a monopolist facing a downward sloping one. The perfectly competitive paradigm of the producer as a price taker should be ignored to analyze the dynamics of price adjustment. However, considering that the study focuses on the reaction of economic units to given wage and price levels and analyzes the validity of the price mechanism based on such reactions, this study does not contradict Arrow's indication. As a result, quantity constraint models are realized as a theoretical model in this study.

Although Benassy (1975) developed a general model of quantity constraint very formally, Negishi (1979) considered a simple example given by Benassy (1977) to reveal the implications of quantity constraint models dramatically, which slightly differs from that of

Benassy because of his attempt to simplify the theory. Consider a short-run economy comprising two aggregated or representative agents: a consumer household and a firm. In addition, there are consumer goods, labor, and money. Correspondingly, two markets exist wherein goods and labor are exchanged for money.

The short-run production function of the representative firm is

$$Y^S = F(L^D) \quad F' > 0, F'' < 0, \tag{1}$$

where Y^S denotes the level of output (i.e., supply) of consumer goods, and L^D is the level of labor input (i.e., demand), and the utility function of the representative consumer is

$$U = a_1 \log Y^D + a_2 \log M + a_3 \log(L_0 - L^S) \quad a_i > 0, \tag{2}$$

which is a log-linear function of the demand for goods Y^D, the demand for money M, and leisure $L_0 - L^S$ (the total amount of time available minus the supply of labor service).

Walrasian notional demand and supply from the competitive firm are

$$L^D = (F')^{-1}\left(\frac{W}{P}\right) = L_1, \; Y^S = F(L_1) = Y_1, \tag{3}$$

where P denotes the given price of goods, and W denotes the given price of wages. The Walrasian budget constraint is

$$PY^D + M + W(L_0 - L^S) = M_0 + \Pi + WL_0, \tag{4}$$

where M_0 implies the initial amount of money and Π denotes the profit distributed by the firm. The maximization of Eq. (2) subject to Eq. (4) gives

$$Y^D = \frac{a_1}{a_1 + a_2 + a_3} \frac{M_0 + \Pi + WL_0}{P}$$

and

$$L_0 - L^S = \frac{a_3}{a_1+a_2+a_3}\frac{M_0+\Pi+WL_0}{W}.$$

Therefore, Walrasian notional demand and supply from the competitive consumer are

$$Y^D = \frac{a_1}{a_2}\frac{M_0}{P} = Y_2 \tag{5}$$

and

$$L^S = L_0 - \frac{a_3}{a_2}\frac{M_0}{W} = L_3 \tag{6}$$

when the profit is considered as

$$\Pi = PY^D - WL^S,$$

which is not the profit planned by the firm but that expected by the consumer. Corresponding to Y_2 and L_3, let us define L_2 and Y_3 by

$$Y_2 = F(L_2), \quad Y_3 = F(L_3). \tag{7}$$

Disequilibrium combinations of real wages W/P and real balance M_0 /P are grouped into the four following cases according to the sign of notional excess demand in the goods and labor markets:

$$\text{I } Y^D - Y^S > 0,\ L^D - L^S < 0$$

$$\text{II } Y^D - Y^S < 0,\ L^D - L^S < 0$$

$$\text{III } Y^D - Y^S > 0,\ L^D - L^S > 0$$

$$\text{IV } Y^D - Y^S < 0,\ L^D - L^S > 0.$$

Figure 4 represents this combination in a (M_0 /P, W/P) diagram.

[Figure 4 near here]

The downward sloping curve L_1L_2 in the figure is the equilibrium locus of the goods market, which shows the different combinations of real wages and real balance that satisfies the condition $L_1 = L_2$. Because L_1 corresponds to the notional supply of the firm Y^S in Eq. (3) and L_2 to the notional demand of the consumer Y^D in Eq. (7) and Eq. (5), the condition $L_1 = L_2$ assures equilibrium in the goods market. This locus is downward sloping because L_1 is decreasing with respect to W/P in Eq. (3), while Y_2, and therefore L_2, is increasing with respect to M_0/P in Eq. (5). Any point to the left of this curve implies excess supply in the goods market because it corresponds to $L_1 > L_2$, whereas any point to the right of this curve implies excess demand in the goods market because it corresponds to $L_1 < L_2$.

Similarly, the upward sloping curve L_1L_3 in Figure 4 indicates the equilibrium locus of the labor market. Considering that L_1 is the notional labor demand of the firm L^D in Eq. (3) and L_3 is the notional supply of labor L^S in Eq. (6), the labor market is cleared if $L_1 = L_3$. This locus is upward sloping because L_1 will decrease in response to an increase in W/P from Eq. (3), while M_0/W must increase in Eq. (6) to maintain the equality of L_1 and L_3, which, considering the increasing W/P, requires an increase in M_0/P. Any point to the left of this curve implies excess supply in the labor market because it corresponds to $L_1 < L_3$, whereas any point to the right of this curve implies excess demand in the labor market because it corresponds to $L_1 > L_3$.

Area I in Figure 4 indicates that notional excess demand exists in the goods market and excess supply exists in the labor market. In Area II (III), excess supply (demand) prevails in both the goods and labor markets. In Area IV, there is excess demand in the labor market along with excess supply in the goods market. The Walrasian general equilibrium is established only at the point of intersection of the curves L_1L_2 and L_1L_3, that is, point E^W.

In the respective areas, for example, Area II in the figure, because excess supply exists in both markets, notional supplies $Y^S = Y_1$ and $L^S = L_3$ are not realized. Considering that the firm is not constrained in the labor market, $Y^S = Y_1$ remains the effective supply Y^{SE} in the goods market; that is, $Y^{SE} = Y_1$. Because the consumer is constrained in the labor market, however, the effective demand for goods Y^{DE} is again obtained using the budget constraint:

$$PY^D + M = M_0 + \Pi + WL, \tag{8}$$

where L is the realized employment. Equation (8) replaces L^S with L in the Walrasian budget constraint (4). The realized profit is

$$\Pi = PY - WL, \tag{9}$$

where Y is the realized purchase of goods. The maximization of utility (2) with respect to Y^D and M subject to Eq. (8) and Eq. (9) gives

$$Y^{DE} = \frac{a_1}{a_1 + a_2}\left(\frac{M_0}{P} + Y\right). \tag{10}$$

As the consumer is on the short side of the goods market, we have

$$Y = Y^{DE}. \tag{11}$$

From Eqs. (10), (11), and (5), the effective demand for goods is

$$Y^{DE} = \frac{a_1}{a_2}\frac{M_0}{P} = Y_2 \tag{12}$$

and therefore, the excess effective demand for goods is

$$Y^{DE} - Y^{SE} = Y_2 - Y_1 \tag{13}$$

in Area II. In the labor market, however, the effective supply L^{SE} corresponds to the notional supply $L^S = L_3$ because the consumer is not constrained in the goods market, and no dual decisions are made.[3] Effective demand for labor differs from the notional demand because the firm is on the long side of the goods market. The firm must plan regarding demand for labor depending on realized sales in the goods market, which is Y_2 according to Eqs. (11) and (12). The effective demand for labor L^{DE} is therefore L_2. Consequently, the excess effective demand for labor is

$$L^{DE} - L^{SE} = L_2 - L_3. \tag{14}$$

Because L_2 and Y_2 are the least among L_i and Y_i, respectively, in Area II and are therefore realized,[4] excess effective supply dominates, as expected, the labor and goods markets in Area II.

In Area III, excess demand exists in both markets and therefore notional demands $Y^D = Y_2$ and $L^D = L_1$ are not realized. Considering that the firm is on the short side of the goods market, effective demand for labor L^{DE} is the same as the notional demand $L^D = L_1$; that is, $L^{DE} = L_1$. The consumer must make dual decisions regarding the supply of labor because it is constrained in the goods market. Effective supply of labor is again achieved by maximizing Eq. (2) subject to

$$PY + M + W(L_0 - L^S) = M_0 + \Pi + WL_0, \tag{15}$$

where Y is the realized purchase of goods. This gives

$$L^{SE} = L_0 - \frac{a_3}{a_2 + a_3}\frac{M_0 + \Pi + WL_0 - PY}{W}. \tag{16}$$

Considering that the consumer is on the short side of the labor market, the realized profit is

$$\Pi = PY - WL^{SE}. \tag{17}$$

From Eqs. (16) and (17), the effective supply of labor is

$$L^{SE} = L_0 - \frac{a_3}{a_2}\frac{M_0}{W} = L_3, \tag{18}$$

owing to Eq. (6). Therefore, the excess effective demand in the labor market is

$$L^{DE} - L^{SE} = L_1 - L_3. \tag{19}$$

In the goods market, however, the effective demand Y^{DE} corresponds the notional demand $Y^D = Y_2$; that is, $Y^{DE} = Y_2$ because the consumer is not constrained in the labor market, and there are no dual decisions.[5] Effective supply in the goods market, in contrast, differs from the notional supply because the firm is on the long side of the labor market and has to make dual decisions on the supply of goods. The firm's supply plan must be based on the realized purchase of labor, which is L_3 from Eq. (18). Therefore, the effective supply of goods Y^{SE} is Y_3. Excess effective demand in the goods market is then

$$Y^{DE} - Y^{SE} = Y_2 - Y_3. \tag{20}$$

Because L_3 and Y_3 are, respectively, the least among L_i and Y_i in Area III and are therefore realized,[6] excess effective demand exists, as expected, in both the labor and goods markets in Area III.

Similarly, in Area I, dual decisions are made, and effective excess demand is derived. Therefore, the sign of effective excess demand is the same as the sign of notional excess demand in Area I and in Areas II and III. This implies that the effective excess demand for goods is positive and that for labor is negative, and they are

$$Y^{DE} - Y^{SE} = \frac{a_2}{a_1 + a_2}(Y_2 - Y_1)$$

and

$$L^{DE} - L^{SE} = \frac{a_2}{a_2 + a_3} (L_1 - L_3),$$

respectively.

Finally, in the case of Area IV, because the consumer is not constrained in both markets, effective demand in the goods market and effective supply in the labor market are, respectively, the same as the notional ones, $Y^D = Y_2$ and $L^S = L_3$, that is, $Y^{DE} = Y_2$ and $L^{SE} = L_3$. The firm is, however, constrained in both markets and dual decisions must be made on the demand in the labor market and supply in the goods market. Effective demand in the labor market is $L^{DE} = L_2$ because the supply from the firm in the goods market is constrained at Y_2. Effective supply in the goods market is $Y^{SE} = Y_3$ because the demand from the firm in the labor market is constrained at L_3. Therefore, effective excess demands in the labor and goods markets are, respectively,

$$L^{DE} - L^{SE} = L_2 - L_3$$

and

$$Y^{DE} - Y^{SE} = Y_2 - Y_3 = F(L_2) - F(L_3).$$

Their signs depend on the relative magnitude of L_2 and L_3.

Figure 5 is obtained from Figure 4 by adding the L_2L_3 curve, which shows the combination of W/P and M_0/P satisfying the condition $L_2 = L_3$. This curve is upward sloping because L_2 increases with an increase in M_0/P from Eq. (5) while M_0/W decreases according to Eq. (6) to maintain L_3 equal to the increased L_2, and therefore W/P must increase. Considering that any point to the left of this curve satisfies the inequality $L_2 < L_3$, and any point to the right satisfies $L_2 > L_3$, dual decisions must be made under each disequilibrium. In Figure 4, the subarea of Area IV, which is also shown to the left of L_2L_3 in Figure 5, excess supply exists in both the labor and goods markets. We have Eqs. (13) and (14) again as the

results of further dual decisions. In Figure 5, therefore, Area II is enlarged to include this subarea where effective excess demand is negative in both the labor and goods markets. Similarly, in the subarea of Area IV located to the right of L_2L_3, excess demand dominates both the markets. Dual decisions repeated imply Eqs. (19) and (20) again, where effective excess demand is positive in both the goods and labor markets. Therefore, Area III is enlarged to include this subarea in Figure 5, where Area IV declines into a part of the curve L_2L_3, that is, E^WL_3.

[Figure 5 near here]

Only at E^W in Figure 5, the Walrasian notional demand is balanced with the corresponding Walrasian notional supply in both the markets. Keynesian situations are cases in which effective excess supply exists in both markets, as shown in Area II. The combinations of W/P and M_0/P on the curve E^WL_3 are non-Walrasian equilibria, where effective demand and supply are equal in both the markets. However, they are not Keynesian underemployment equilibria as the household is not constrained and no Keynesian involuntary unemployment exists. The theory of dual decisions assumes that the speed of quantity adjustments is much faster than that of price adjustments. Keynesian conditions are, then, disequilibria in which there is effective excess supply in both the labor and goods markets. However, how can such disequilibria be considered Keynesian equilibria? This is a key limitation of quantity constraint models, and the reason why they fail to be accepted as the micro theory of Keynesian economics.

3.3 Market failure in the short-run macro economy: innovative results based on the quantity constraint models

Although quantity constraint models could not be established as the micro theory of Keynesian economics, these models can be used to challenge the validity of the price

mechanism in the macro economy. New classical macroeconomics assumes the Walrasian general equilibrium by assuming sufficient flexibility of wages and prices even in the short run. This subsection examines the validity of the assumption of perfect short-run market mechanisms in the macro economy.

Figure 6(a) illustrates how the economy denoted by a point (M_0/P, W/P) in Area II in Figure 4 converges at the Walrasian general equilibrium E^W under the assumption of perfect flexibility of wages and prices and therefore of real wages and real balances. This study assumes that W/P also declines in deflationary Area II, where both W and P decline, and W/P also rises in inflationary Area III, where both W and P rise. If it was assumed that W/P rises in Area II and declines in Area III, the supposition is intuitively invalid and must be examined further. Furthermore, the Walrasian price mechanism is not achieved under such a supposition. (The explanation is omitted). Additionally, assuming W/P = constant in Area II and III is excluded similarly.

[Figure 6 near here]

The Walrasian price mechanism, such as in Figure 6(a), assumes that goods and labor markets are completely independent under disequilibrium; that is, it ignores the existence of spillover effects, or derived demand effects are inevitable between both markets under disequilibrium. Therefore, the analysis regarding adjustment processes in the macro economy must be based on Figure 5 considering the spillover effects, or derived demand effects under disequilibrium. Figure 6(b) illustrates how the economy designated by a point (M_0/P, W/P) traces its path in each area in Figure 5 under the assumption of perfect flexibility of wages and prices and therefore of real wages and real balances.

Furthermore, elucidating each area in Figure 6(b) is an analytical approach to explore the validity of the price mechanism in a macroeconomy, where spillover effects under

disequilibrium are considered. First, in Area II, as intended by Keynes, there exists effective excess supply in both the goods and labor markets: the area is in deflation. Therefore, it is assumed that P, W, and W/P are completely flexible downward to analyze the validity of the price mechanism in Area II. Consequently, a point (M_0/P, W/P) moves in the right and downward direction. This study focuses on whether the economy designated by the point reaches the Walrasian general equilibrium E^W; specifically, whether effective excess supply of both goods and labor at the point decreases to zero.

The effective excess supply of goods is

$$Y^{SE} - Y^{DE} = Y_1 - Y_2 > 0$$

$$= F\left(L_1\left(\frac{W}{P}\right)\right) - \frac{a_1}{a_2}\frac{M_0}{P} > 0 \tag{21}$$

Equation 21 will not become zero through a decline in W/P and an increase in M_0/P; that is, $Y_1 = Y_2$ ($L_1 = L_2$) will not be realized. However, because the effective excess supply of labor is

$$L^{SE} - L^{DE} = L_3 - L_2 > 0$$

$$= \left(L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) - \left(\text{L corresponding to } Y_2 = \frac{a_1}{a_2}\frac{M_0}{P}\right) > 0, \tag{22}$$

it will gradually become zero due to a decline in W and an increase in M_0/P; that is, $L_2 = L_3$ will be realized. In Area II, therefore, the economy will reach any point on the E^WL_3 curve. This area is divided into two parts to confirm where the economy intersects the curve.

Dividing Area II into subareas indicating points higher and lower than W/P at the Walrasian equilibrium, then in the lower subarea, the economy always arrives at some point on the E^WL_3 curve except E^W, as indicated by the trajectory of A in Figure 6(b). In this subarea, the economy never reaches E^W. This implies that the Walrasian general equilibrium

is never realized; however, a non-Walrasian equilibrium is realized. In contrast, even in the upper subarea, the economy always arrives at some point on the E^WL_3 curve except E^W, as shown by the trajectory of B in Figure 6(b) unless a_1/a_2 is sufficiently large. Even in this subarea, the economy never reaches the Walrasian general equilibrium and a non-Walrasian equilibrium is realized as long as a_1/a_2 is not sufficiently large.

Given that a_1/a_2 is sufficiently large in Eq. (21), the effects of the increase in M_0/P (i.e., the real balance effects) become sufficiently large, and therefore the effective excess supply of goods becomes zero. Particularly, the economy reaches on the L_1L_2 curve. Then, the economy converges at the intersection point of the L_1L_2 and L_2L_3 curves, namely, the Walrasian general equilibrium E^W, similar to the trajectory of C or C' in Figure 6(b). Defining e_1 and e_2 as the elasticity of utility for the demand for goods and elasticity of utility for the demand for money, respectively, we have $a_1/a_2 = e_1/e_2$ because $a_1 = e_1U$ and $a_2 = e_2U$. Particularly, a_1/a_2 is the ratio of each elasticity defined earlier. Hence, only if the elasticity of demand for goods is significantly larger than the demand for money elasticity, that is, only if consumption is more profitable than money holding, the Walrasian general equilibrium emerges.

However, such a condition is not satisfied under real deflation. In contrast, money holding is more profitable than consumption. The following three points are presented as empirical foundations to substantiate this assertion. First, in the deflationary situation such as that depicted in Area II, decreased incomes and uncertainty of business and employment strengthen saving and considerations of safety. The former tendency decreases consumption and consequently increases money holding. The latter tendency also increases money holding as a safe financial asset. Second, because individual's deflationary expectations curb their present consumption, consumption decreases and money holding increases. Third, although the model lacks an integrated rate of interest, very low rates of interest under deflation

increase money hoarding by households. Decline in aggregate demand in turn decreases firms' demand for funds and increases their funds in hand (the third point corresponds to a "liquidity trap"). Under these conditions, therefore, the Walrasian general equilibrium cannot be expected due to small real balance effects.

Next, Area III, unlike in Area II, has effective excess demand in both the goods and labor markets: the area is in inflation. Thus, it is supposed that P, W, and W/P are completely flexible upward to analyze the validity of the price mechanism in Area III. Consequently, a point (M_0/P, W/P) moves to the left and upward direction. This study focuses on whether the economy denoted by the point will reach the Walrasian general equilibrium E^W.

The effective excess demands for labor and goods are, respectively,

$$L^{DE} - L^{SE} = L_1 - L_3 > 0$$

$$= L_1\left(\frac{W}{P}\right) - \left(L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) > 0 \tag{23}$$

$$Y^{DE} - Y^{SE} = Y_2 - Y_3 > 0$$

$$= \frac{a_1}{a_2}\frac{M_0}{P} - \left(\text{Y corresponding to } L_3 = L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) > 0. \tag{24}$$

The economy reaches either the L_1L_3 or L_2L_3 curve. This area is grouped into three parts as in Figure 6(b) based on the levels of M_0/P and W/P at the Walrasian equilibrium to confirm where the economy arrives on either curve.

In the lower left subarea, the economy necessarily arrives at any point on the E^WL_3 curve except the point E^W; thus, the Walrasian equilibrium is never realized. In the upper right subarea, the economy necessarily arrives at any point on the L_1E^W curve except E^W and thereafter enters Area I.

In the lower right subarea, when a_1/a_2 is sufficiently large in Eq. (24), the effects of the decrease in M_0/P (i.e., negative real balance effects) become sufficiently large, and therefore the effective excess demand for goods decreases rapidly to zero. Consequently, the condition $Y_2 = Y_3$ is realized: the economy reaches a point on the L_2L_3 curve. In an inflationary situation, such as in Area III in contrast to Area II, $a_1/a_2 = e_1/e_2$ is assumed to be sufficiently large: the elasticity of utility for the demand for goods is sufficiently larger than the elasticity of utility for the demand for money; in other words, consumption is sufficiently preferred to money holding. The following are the empirical foundations that satisfy this condition. First, inflation-induced decrease in money value makes consumption more profitable than money holding. Second, because people's inflationary expectations stimulate their present consumption, money holding decreases. Hence, in this subarea, the economy is most likely to arrive at some point on the E^WL_3 curve, except point E^W. Only in the case of simultaneous realization of both the conditions $L_1 = L_3$ and $Y_2 = Y_3$ ($L_2 = L_3$), E^W is established in this subarea. Because a_1/a_2 is sufficiently large in this area, there is little possibility that the economy will arrive on the L_1E^w curve and thereafter enter Area I.

Finally, in Area I, P is assumed to be completely flexible upward and W downward because of the effective excess demand for goods and effective excess supply of labor. A point $(M_0/P, W/P)$, therefore, moves toward the left and downward. The effective excess demand for goods and the effective excess supply of labor are, respectively,

$$Y^{DE} - Y^{SE} = \frac{a_2}{a_1+a_2}(Y_2 - Y_1) > 0$$

$$= \frac{a_2}{a_1+a_2}\left\{\frac{a_1}{a_2}\frac{M_0}{P} - F\left(L_1\left(\frac{W}{P}\right)\right)\right\} > 0 \qquad (25)$$

and

$$L^{SE} - L^{DE} = \frac{a_2}{a_2+a_3}(L_3 - L_1) > 0$$

$$= \frac{a_2}{a_2+a_3}\left\{\left(L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) - L_1\left(\frac{W}{P}\right)\right\} > 0. \quad (26)$$

The economy reaches either the L_1L_2 or L_1L_3 curve. This area is divided into left and right subareas with respect to M_0/P at the Walrasian equilibrium to confirm where the economy arrives on each curve.

In the left subarea, the economy always arrives at some point on the L_1E^Wcurve, except point E^W, and subsequently enters Area II. In the right subarea, the economy arrives on the L_1E^W curve and subsequently enters Area II or converges at E^W. In Area I, the economy traces one of three trajectories because a_1/a_2 in Eq. (25) is supposed to be larger than in Area II but smaller than in Area III.

The above analyses on the validity of the price mechanism in the macroeconomy show that the price mechanism is significantly incomplete in a short-term macroeconomy and does not function, particularly under deflation. Furthermore, the study shows that the economy is most likely to converge at a non-Walrasian equilibrium as long as wages and prices are sufficiently flexible. At this equilibrium, no Keynesian involuntary unemployment exists; however, because it is not the Walrasian equilibrium, the Pareto-optimum state is not realized. Therefore, it is a market failure of the macroeconomy that the price mechanism does not fully function but is very incomplete at the short-run macro level. Thus, assuming that the price mechanism at the micro level holds as it does in the macro level can be considered fallacy of composition. Thus, this analysis is the basis for an argument that macroeconomics is theories different from microeconomics. Therefore, big questions are raised regarding DSGE theory, such as real business cycle (RBC) models that assume the existence of a perfect market mechanism even in the short run.

4 Market failure in the macroeconomy does not change even in the long run: An inevitable conjecture from the short-run analysis

The third section, which discussed the short run when only labor was variable, showed that the price mechanism in the macroeconomy is very incomplete. This section shows that the results of the short-run analysis support the argument that even in the long run, the price mechanism in the macroeconomy will not function effectively as in the short run. Hence, the validity of the natural rate hypothesis as a likely supposition in long-run analyses is debated. In this study, the long run is defined in neoclassical terms. Specifically, it is assumed that the complete flexibility of wages and prices, the volumes of existence of labor and capital, and production technology are all given.

4.1 A classical long-run equilibrium model

Figure 7 is a classical long-run equilibrium model assuming the complete flexibility of W, P, and R (rental price of capital).

[Figure 7 near here]

In the figure, R/P is the real rental price of capital, and $\overline{L}$, $\overline{K}$, and $\overline{Y}$ are the volumes of the existence of labor and capital in the long run, and the level of full employment or natural rate of output, respectively. LRAS is the long-run aggregate supply curve in the goods market. The general equilibrium in the classical long-run model is the intersection, E^W, of the notional demand and supply equilibrium conditions in the respective goods, labor, and capital markets: $Y^D = \overline{Y}$, $L^D = \overline{L}$, and $K^D = \overline{K}$.

However, the model is much problematic in that under the arbitrary assumption that each market is independent of each other even in the long run, it does not consider the spillover effects, or derived demand effects among the markets under long-run disequilibrium.

4.2 Market failure in the macroeconomy does not change even in the long run

If the model considered those effects among the markets under long-run disequilibrium, it can

be easily conjectured from the results of short-run analysis that the economy would not achieve the general equilibrium, E^W, at least under deflation. Therefore, the following supposition holds inevitably in the long-run analysis as an extension of the short-run analysis. Even if W, P, and R are completely flexible in the long term, the price mechanism does not function, especially under deflation. Consequently, the natural rate hypothesis and the neutrality of money are invalid. At the macro level, the price mechanism is much more incomplete than previously supposed, regardless of whether the short or long run is considered.

5 Cause of involuntary unemployment lies eventually in quantitative aspects, that is, lack of demand: Keynes' unemployment equilibrium

Earlier, the price mechanism was shown to be clearly incomplete in the macroeconomy and not to function, at least under deflation. Hence, this section indicates the existence of Keynes' equilibrium with involuntary unemployment.

However, earlier studies of Keynesian equilibrium must be examined for the following inherent drawbacks. In particular, the validity of the Walrasian general or full employment equilibrium supposing wage and price flexibility must be examined to evaluate the perfect price mechanism, as in Section 3 and 4. Moreover, it must be first studied within a framework similar or identical to the neoclassical approach; otherwise, any analysis of the Keynesian equilibrium is insufficient to invalidate the neoclassical supposition of the perfect price mechanism.

As long as the price mechanism does not function under deflation, the Walrasian general equilibrium is not established, and therefore the economy's optimal condition is not realized.

Thus, supposing wage, price, and real-wage flexibility is illogical. As a result, the cause of unemployment is not attributed to real-wage rigidity as stated by the new Keynesianism.

Keynes' unemployment equilibrium is eventually realized in a macroeconomic deflationary environment. The cause of involuntary unemployment lies in not price but quantitative aspects. In other words, the unemployment results from a shortage in labor demand under rigid real wages and not from real-wage rigidity. This result becomes possible by improving and reinterpreting Shapiro and Stiglitz's (1984) efficiency wage model, which explains real-wage inflexibility. Thus, developing a new model to justify this result is not always necessary.

5.1 The Shapiro–Stiglitz efficiency wage model

New Keynesianism holds that involuntary unemployment is generated because real wages are sticky, and develops efficiency wage theory and insider–outsider theory based on the root causes of real-wage stickiness.[7] The efficiency wage model holds that high wages increase motivation to work and increase profits by enhancing productivity more than labor costs. Particularly, Shapiro-Stiglitz's model focuses on the possibility that firms' limited monitoring abilities force them to provide their workers with an incentive to exert effort. Theoretically, this is the most rigorous efficiency wage model. See the following Figure 8.

[Figure 8 near here]

The economy comprises innumerable workers, $\bar{L}$, and a large number of firms, N. The NSC (no-shirking condition) in Figure 8 shows that in imperfect monitoring, the real-wage, w, that firms must pay to induce workers to exert effort is an increasing function of the employment level, NL. The conventional labor demand curve is denoted by L^D. Labor supply, L^S, is horizontal at the worker's effort level $\bar{e}$ up to $\bar{L}$ number of workers and then becomes vertical. In the absence of imperfect monitoring, equilibrium occurs at the intersection of labor demand and supply; the Walrasian equilibrium occurs at point E^W in the diagram. When

monitoring is inadequate, equilibrium occurs at the intersection E of the L^D curve and the NSC locus. There is unemployment at this point of equilibrium. Because real wages are determined at equilibrium and not adjusted below it, unemployment persists even in equilibrium. This contradicts the previous conclusion that the cause of unemployment cannot be attributed to real-wage rigidity. However, Keynes' unemployment equilibrium can be explained by improving and reinterpreting the model, as shown below.

5.2 Improvement and reinterpretation of the model: Keynes' unemployment equilibrium

According to the Shapiro–Stiglitz model in Figure 8, unemployment is caused by a lack of aggregate demand and, as a result, labor demand. There is no unemployment if aggregate and labor demand are sufficient. The L^D curve in Figure 8 shifts depending on the business situation, or the level of aggregate demand. The higher the level of aggregate demand, the closer the L^D curve is to the right-hand side; thus, unemployment falls (correspondingly, real wages rise). In contrast, as aggregate demand falls, the L^D curve shifts to the left-hand side; thus, unemployment rises (correspondingly, real wages decline). This indicates that the cause of unemployment is not real-wage rigidity, as Shapiro and Stiglitz argued, but a lack of labor demand under real-wage rigidity, as Keynes emphasized. This conclusion does not contradict real wages' moderate procyclicality.[8] According to Tobin (1993), in the absence of instantaneous and complete market clearing, aggregate demand restricts output and employment, that is, "any failure of price adjustments to keep markets cleared opens the door for quantities to determine quantities."

Regarding the Shapiro–Stiglitz model, an empirical problem is that the survey evidence is less favorable. Respondents consistently express little sympathy for the idea that imperfect monitoring and effort on the job are important to their decisions about wages.[9] Therefore, the model should be re-examined based on a more valid implication about the determinants of the

efficiency wage. The theoretical issues with *bonding* and *job selling* as indicated by Carmichael (1985) will be examined in a future work.

Finally, this section critically analyzes an empirical study based on the RBC models concerning the long-term stagnation of the Japanese economy after the 1990s. The model uses the given conditions for each path of government expenditure and total factor productivity (TFP) and concludes that the decline in the TFP growth rate as a reflection of technical progress in 1990s is the primary cause of the Japanese economy's long-term stagnation. Similar conclusion can be drawn with regard to many long-term deep recessions around the world. According to Sections 3 and 4, however, the price mechanism does not function under deflation in the macro economy. Therefore, it is very unlikely that such a conclusion can be derived from the RBC model in which the fully functional price mechanism even in the short-run is a major premise. The decline in the TFP growth rate cannot be identified as the primary cause of the long-term stagnation. Conversely, the long-term slump due to decrease in aggregate demand decreased the TFP growth rate. According to Basu (1996), cyclical variations of TFP measured as a Solow residual are generated by not only technical progress but also variations in operation rates of capital and labor owing to fluctuations in aggregate demand. Therefore, TFP variations cannot be interpreted as variations in technical progress alone.

Furthermore, subsequent empirical studies have sought to examine the cause of decline in the Japanese TFP growth rate. However, these empirical studies do not clarify the main cause of this decline. In contrast, empirical studies on the determinants of TFP, which have considered industrial organization, labor markets, and international trade, have not clarified the most important residual problem. This arises from the earlier issue regarding the validity of the RBC theory.

6 Concluding remarks

Based on the long-term sluggishness of the Japanese economy for more than 10 years since the 1990s and the recent US and European experiences, a critical question was raised about the prevailing theories of modern macroeconomics regarding the price mechanism and unemployment. Clearly, the perspective on the price mechanism is incomplete in the short-run macroeconomy and does not function, especially under deflation: market failure in the short-run macroeconomy. This study examined this result using the concept of quantity constraint models developed by Benassy and Negishi, which analyze the spillover effects, or derived demand effects between goods and labor markets essential under disequilibrium, hitherto ignored by modern macroeconomics.

From the results of the short-run analysis, this study inevitably conjectures that even in the long run, the price mechanism would fail, especially under deflation. Consequently, the study suggests that the natural rate hypothesis in the long run and the neutrality of money would not be realized.

From the demonstrated market failure in the macro economy and based on the improvement and reinterpretation of the Shapiro–Stiglitz model, this study showed the existence of Keynes' unemployment equilibrium. If the price mechanism fails, then assuming real-wage flexibility is unreasonable, and thus the cause of involuntary unemployment cannot be attributed to the price aspect, that is, to the real-wage rigidity, as new Keynesianism claims. Eventually, it was shown that the cause of involuntary unemployment lies in the quantitative aspect, that is, in the lack of real aggregate demand and therefore labor demand, as Keynes posited.

If the Shapiro–Stiglitz model, which explains the rigidity of real wages, is re-interpreted such that the shortage of labor demand under rigid real wages leads to unemployment, it becomes a powerful model for explaining involuntary unemployment. However, given that

the model has issues, such as lack of supporting evidence from surveys and *job selling*, re-examination of the old models or creation of a new efficiency wage model is needed.

The DSGE theory, such as the RBC model, that presupposes the perfect market mechanism even in the short run is much problematic as a macro theory. Therefore, the ability of such a model to contribute to empirical studies on long-term stagnation in Japan and around the world is very unlikely.

6.1 Role of aggregate demand

Based on the conjecture from the short-run analysis, when there is underemployment of production factors even in the long run, it can be stated that the cause lies in the quantitative aspect as in the short run: in the shortage of real aggregate demand and therefore labor and capital demand. This suggests that real aggregate demand should play a critical role in both the short and long term.

Recent trend is inclined toward rebuilding the new Keynesian DSGE models. If the fundamental and theoretical problem that the macro price mechanism fails, however, is not examined, any valid rebuilding would not be realized.

6.2 Three novel proposals for future contributions of this study's implications

Finally, three possibilities regarding future contributions of implications of this study are proposed. First, as stated earlier, the suggestion that real aggregate demand should play a critical role in both the long and short term could significantly impact the analytical approaches used by ultra-long-run economic growth theories. Both new Keynesian and neoclassical approaches concur that because full employment is realized in the long run when wages and prices are flexible, economic growth in the ultra-long run is toward full employment growth. However, in the long run with flexible wages and prices, there is no need for full employment to be realized. As Yoshikawa (2000) emphasizes, even if the supply

of production factors determines a growth ceiling, these are not necessarily determinants of economic growth. This study considers that the paths of real aggregate demand play an important role even in the process of economic growth.[10]

The second possibility is rebuilding of new Keynesian short-run unemployment equilibrium model. One reason is that the model assumes a long-run steady-state equilibrium, which disagreed in general. The other reason is that the cause of unemployment lies in not the quantitative aspect, that is, the lack of labor demand but the rigidity of price aspect, which we debated. The model that is rebuilt would contribute as a new one for short-run economic policies. Vines and Wills (2018) and Stiglitz (2018) are the effective references for this proposal.

The third possibility is that political indicators to which central banks of developed countries adhere: a target rate of inflation, a natural rate of unemployment, a natural rate of interest, and so on, at long-run steady-state equilibrium in DSGE theory must prove their theoretical foundations.

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Notes

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1 See Kawai (2014), Basic Macroeconomics, Chapter VIII (Column) On the Price Mechanism in Macro Economy, Chapter IX (Column) On the Cause of Involuntary Unemployment.

2 Furthermore, several studies criticize the empirical unreality of the macro price mechanism. However, being no better than criticisms, they will also not be able to influence neoclassical thought.

3 One may object that the consumer, though not constrained in the goods market, is still constrained because the realized profit differs from the expected one. Therefore, this assumption merely serves to simplify the explanation.

4 Note that in Area II, L_2, $Y_2 = Y^D < Y^S = Y_1$, $L_1 = L^D < L^S = L_3$, Y_3.

5 Specifically, again the consumer is constrained by the fact that the realized profit is different from the expected one, which we ignore for simplicity.

6 Note that in Area III, $Y^D > Y^S$ and $L^D > L^S$ in the inequality in note 4.

7 Because insider–outsider models seem to have theoretical problems, we discuss them elsewhere.

8 Alexopoulos (2004) considers a model variation where shirkers, rather than being fired, receive a lower wage for some period. By this change, the cost of forgoing a given amount of wage income does not depend on the prevailing unemployment rate. As a result, the no-shirking locus is flat, and the short-run impact of a shift in labor demand falls entirely on employment.

9 See Romer (2018) p. 505.

10 See Yoshikawa (2000) pp. 51-54.

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Figures

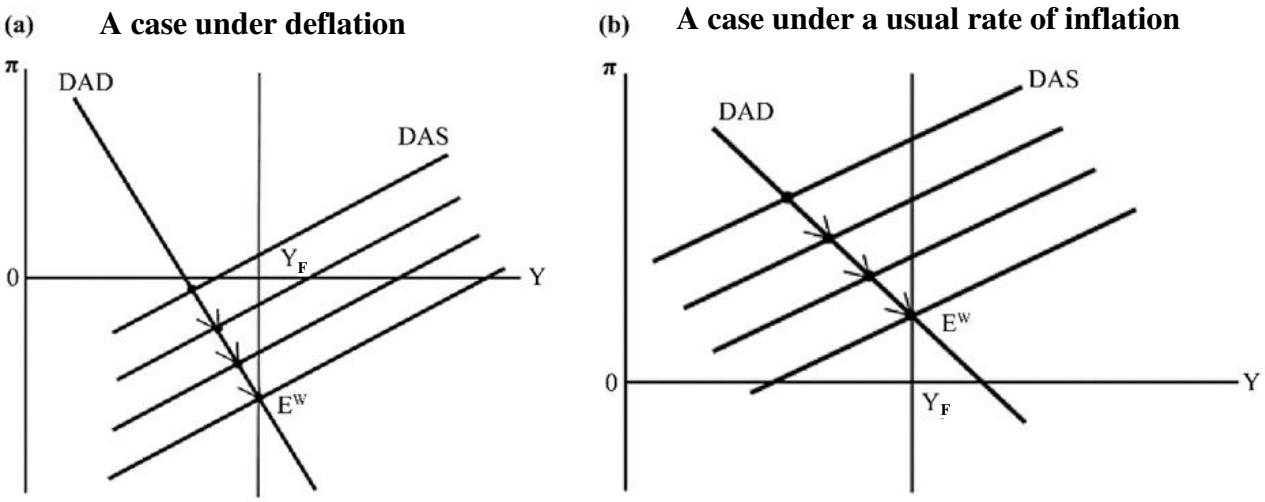


Figure 1. Convergence processes to the long-run equilibrium E^W in a dynamic AD–AS model (based on Mankiw, 2016, Chapter 15).

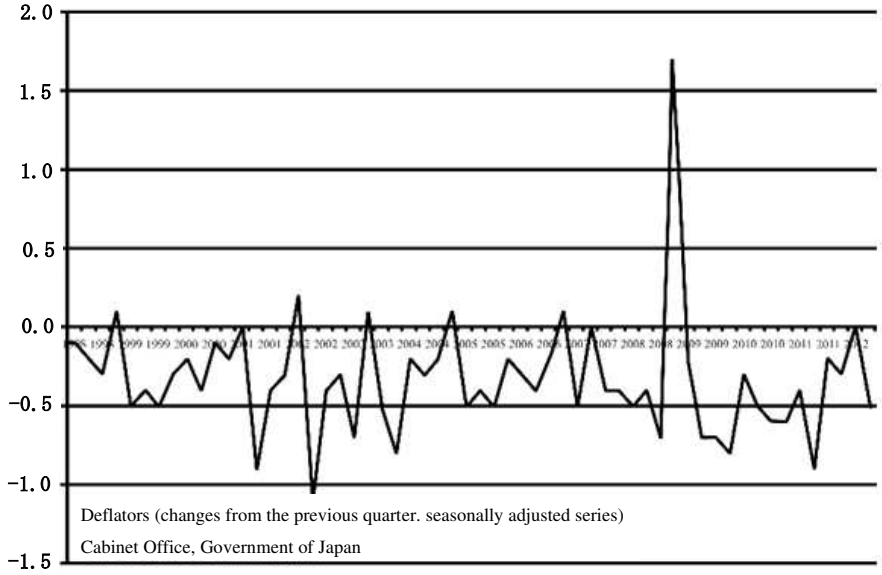


Figure 2. The rates of change of the GDP deflators.

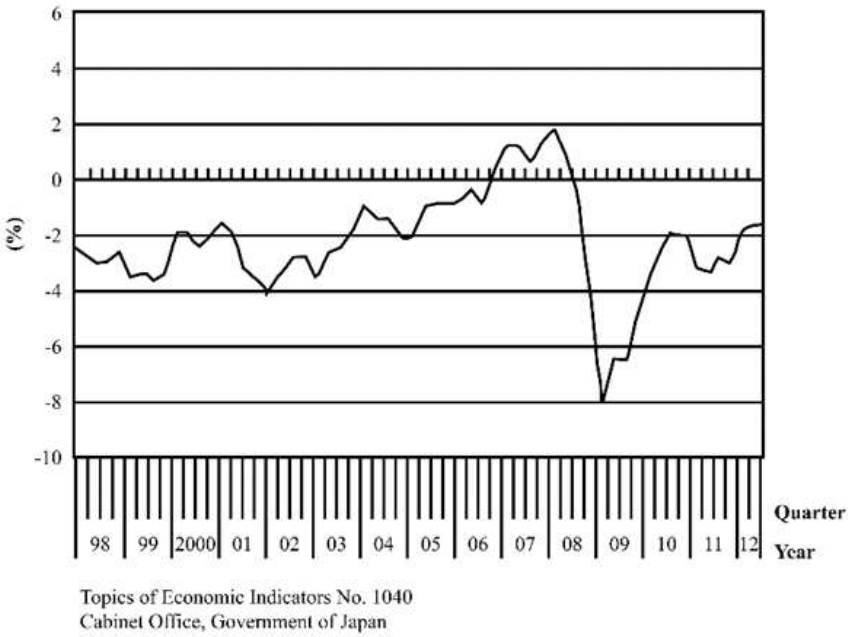


Figure 3. The transition of the GDP gaps.

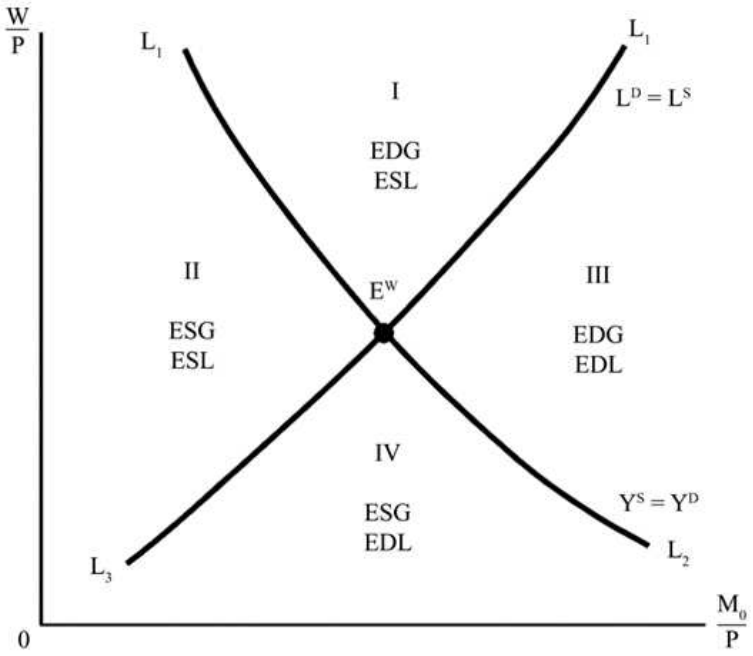


Figure 4. Grouping of disequilibrium combinations of real wages and real balance.

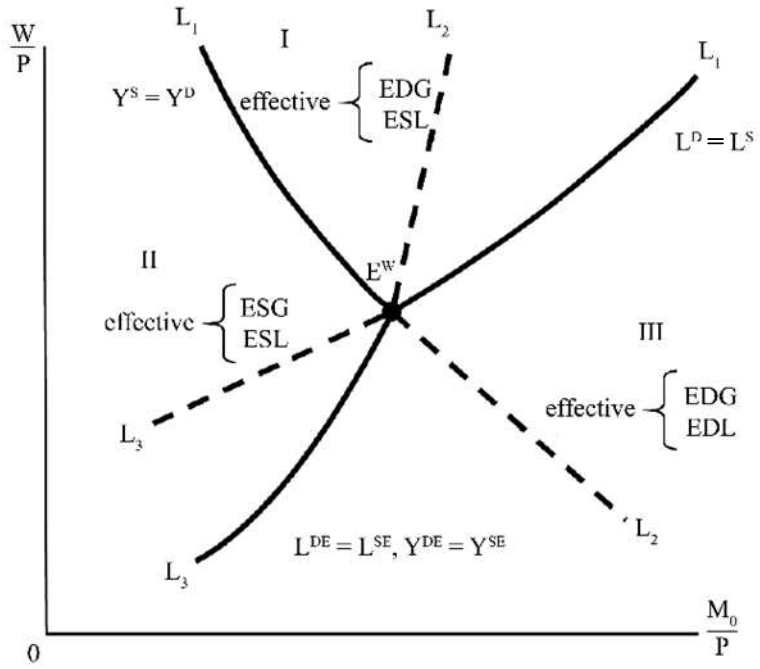
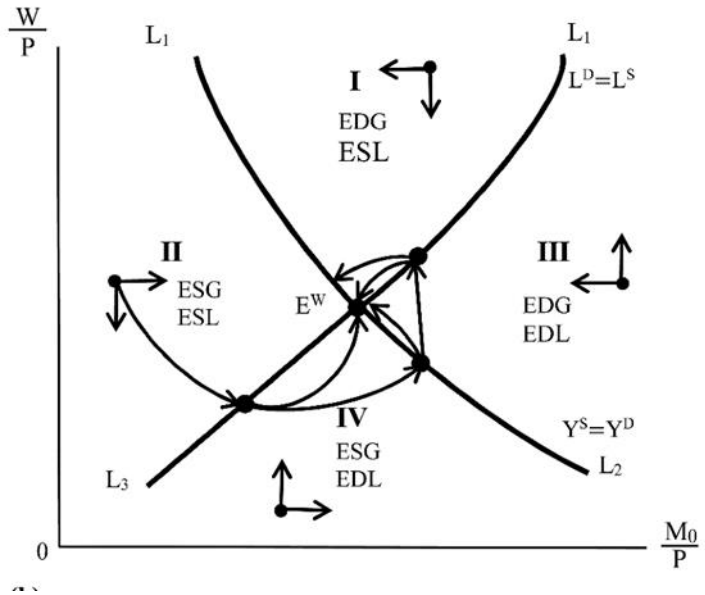
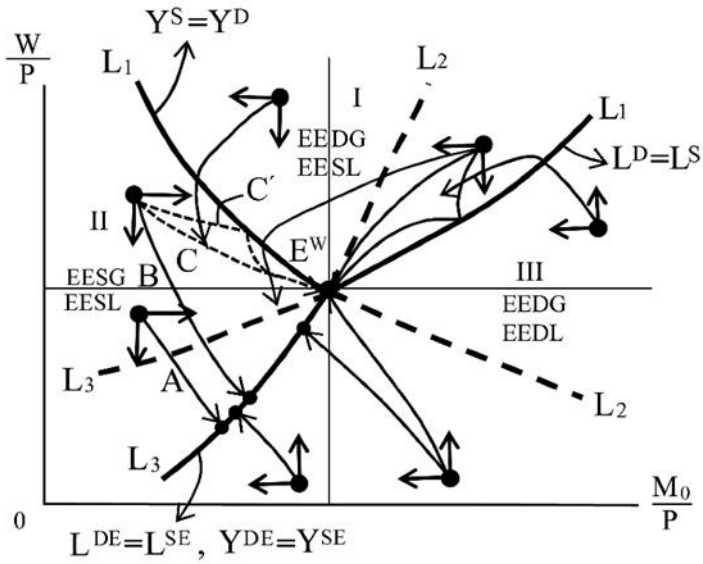


Figure 5. Grouping of combinations of real wages and real balance under disequilibrium of effective supply and demand.

Figure 6.



(a) The Walrasian price mechanism starting from Area II (Note: Self-developed).



(b) Adjustment processes in a macro economy taking spillover effects under disequilibrium into consideration (Note: Self-developed).

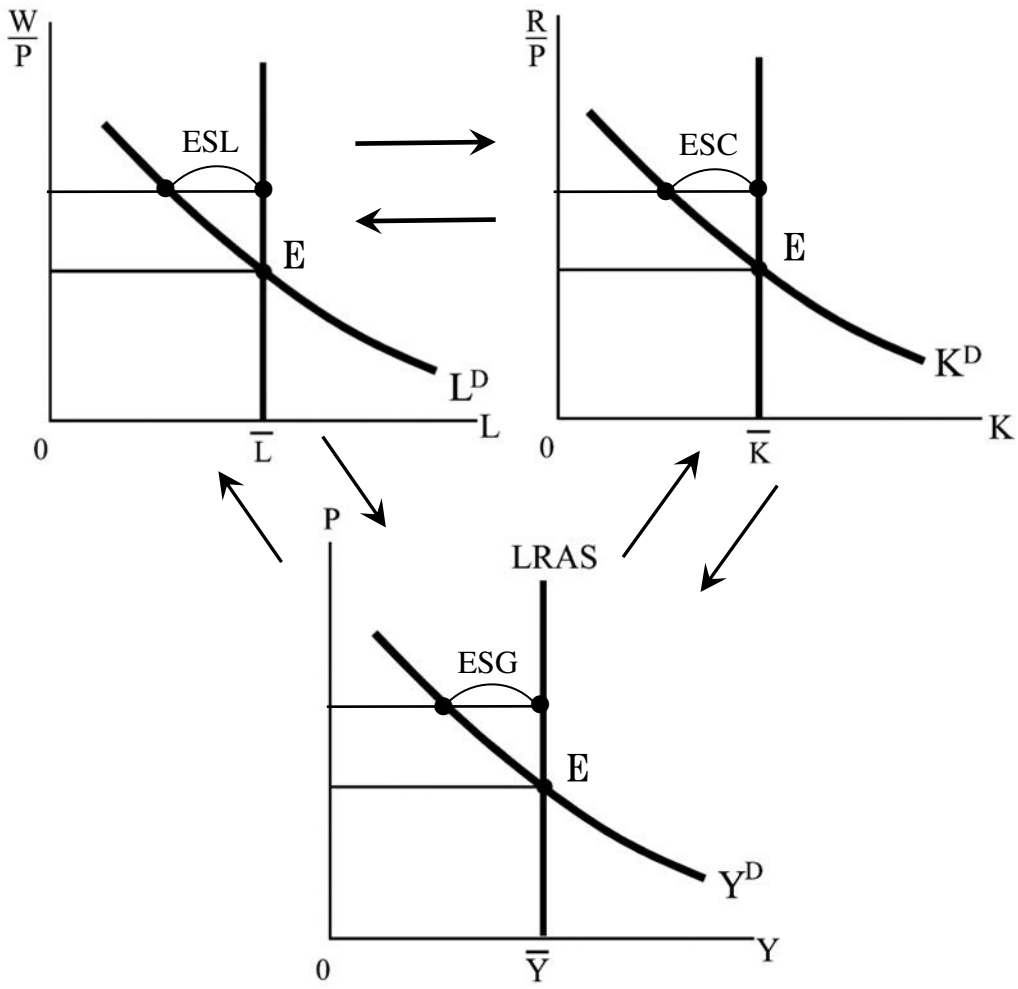


Figure 7. Derived demand effects in a classical long-run equilibrium model (Mankiw, 2016, Chapters 3 and 10).

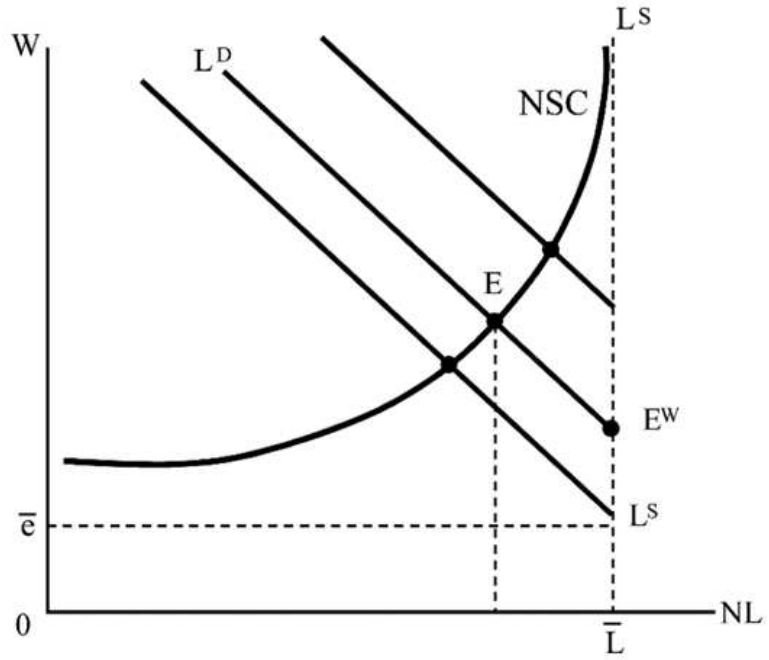


Figure 8. The Shapiro–Stiglitz model.