TCER Working Paper Series

Re-examination of Modern Macroeconomics: Market Failure in a Walrasian Economy and Keynes's Unemployment Equilibrium

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March 2018

Working Paper E-121
http://tcer.or.jp/wp/pdf/e121.pdf

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Abstract

This study reexamines the skepticism toward the prevailing theories of modern macroeconomics based on the observations of a real economy. Two main hypotheses are tested.

First, the price mechanism is significantly incomplete in a Walrasian economy and does not function, particularly under deflation, which leads to market failure in such an economy. This completely differs from "the market failure due to the rigidity of wages and prices, menu cost and asymmetry of information, and so on" as stated by new Keynesianism. The crucial cause of market failure in the Walrasian economy is the unavoidable spillover effects between goods and labor markets under disequilibrium. Walrasian price mechanism completely disregards these effects. Considering these effects, the belief of the Walrasian general equilibrium, along with the assumption of flexible wages and prices, does not hold. The scale of real balance effects is the most critical factor in the study results. A static model suffices for these explications. Dynamic stochastic general equilibrium models are unnecessary and unfeasible.

Second, Keynes's unemployment equilibrium is realized due to market failure in the Walrasian economy. Therefore, involuntary unemployment is a result of quantitative aspects and not price aspects. In other words, involuntary unemployment is not caused by the rigidity of real wages but by a shortage of labor demand under rigid real wages. This is possible by re-interpreting the Shapiro–Stiglitz efficiency wage model. Finally, demand is a critical factor in both the short run and long run.

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Abstract

This study reexamines the skepticism toward the prevailing theories of modern macroeconomics based on the observations of a real economy. Two main hypotheses are tested. First, the price mechanism is significantly incomplete in a Walrasian economy and does not function, particularly under deflation, which leads to market failure in such an economy. This completely differs from "the market failure due to the rigidity of wages and prices, menu cost and asymmetry of information, and so on" as stated by new Keynesianism. The crucial cause of market failure in the Walrasian economy is the unavoidable spillover effects between goods and labor markets under disequilibrium. Walrasian price mechanism completely disregards these effects. Considering these effects, the belief of the Walrasian general equilibrium, along with the assumption of flexible wages and prices, does not hold. The scale of real balance effects is the most critical factor in the study results. A static model suffices for these explications. Dynamic stochastic general equilibrium models are unnecessary and unfeasible.

Second, Keynes's unemployment equilibrium is realized due to market failure in the Walrasian economy. Therefore, involuntary unemployment is a result of quantitative aspects and not price aspects. In other words, involuntary unemployment is not caused by the rigidity of real wages but by a shortage of labor demand under rigid real wages. This is possible by re-interpreting the Shapiro–Stiglitz efficiency wage model. Finally, demand is a critical factor in both the short run and long run.

JEL classification: E12, E24, J22, J23

Keywords: spillover effects under disequilibrium; market failure in Walrasian

economy; Keynes's unemployment equilibrium; the role of aggregate demand

I. Introduction

The following proposition defines the framework of Keynesian macroeconomics: in the short run when wages and prices are inflexible, unemployment equilibrium is realized; in the long run when wages and prices are sufficiently flexible, a Walrasian general equilibrium will exist. In other words, this proposition states that regardless of it being the short or long run, given that wages and prices are sufficiently flexible in the macroeconomy and microeconomy, the market mechanism is fully functional. This proposition is the same as that in neoclassical macroeconomics. Explicitly, the proposition that as long as wages and prices are sufficiently flexible, a Walrasian general equilibrium is realized holds for both Keynesian and neoclassical macroeconomics. Although this major proposition has already been theoretically established in microtheory, the proposition's validity at the macro level remains an assumption, as will be revealed later in this study.

Considering the long-term stagnation experienced by the Japanese economy since the 1990s and recent experiences by the US and Europe, a serious question is raised whether the price mechanism in a microeconomy is sufficiently effective in the macroeconomy as well. It does not seem to realistically function, at least under deflation in the macroeconomy. The proposition that a microtheory mechanism also holds up in macrotheory seems to be a fallacy of composition. Such questions are the basis of the belief that macroeconomics has a unique theoretical paradigm different from that of microeconomics.[1]

This study re-examines and challenges the concept of modern macroeconomics in terms of price mechanism and unemployment based on observations of the real economy and the skepticism described above regarding existing theories. Our main results can be summarized in the

following three points. First, the price mechanism does not function, particularly under deflation in the Walrasian economy, and therefore market failure occurs. This completely differs from "the market failure due to the rigidity of wages and prices, menu costs and asymmetry of information and so forth" as stated by new Keynesianism. Second, this failure leads to Keynes's unemployment equilibrium. Thus, involuntary unemployment is caused by quantitative aspects, i.e., lack of labor demand under rigid real wages. Finally, the implications of our short-run analysis raise questions regarding the long-run functioning of the natural rate hypothesis.

The analytical approaches used to examine the first and second aforementioned points are as follows. When excess supply exists in both macro goods and labor markets, it is theoretically and empirically impossible that wages, prices, and real wages would be sufficiently flexible such that the Walrasian general equilibrium would soon be realized. Therefore, a general excess supply persists under short-run rigid wages and prices; consequently, spillover effects in goods and labor markets that influence each other must operate between both markets. A crucial problem of the Walrasian price mechanism is that both markets are independent of each other and these spillover effects between them, inevitable under disequilibrium, are completely neglected.

In the goods market, for example, firms cannot sell as much as they want due to demand deficiency under present prices. Consequently, they face supply constraints, which is when suppliers cannot eliminate excess supply due to demand deficiency. Firms, therefore, must make dual decisions to have effective demand for labor in the labor market, considering these constraints. On the other hand, in the labor market, workers cannot supply labor as much as they want because of demand deficiency under present wages. Hence, workers cannot accrue wage income as much as they want because of these supply constraints; they have to make dual decisions to achieve effective demand for goods in the goods market, considering these income constraints.

Considering these spillover effects unavoidable under disequilibrium, the Walrasian general equilibrium will never emerge even if wages, prices, and real wages are sufficiently flexible. This condition would lead to market failure in the Walrasian economy; this is the first result, which arises from the theoretical and empirical ineffectiveness of real balance effects under deflationary situations. It is in line with theoretical proof on the most important Keynes's propositions put forth by Tobin: the proposition that flexible wages and prices will not stabilize a monetary economy.[2] For this analysis, Negishi's (1979) comment on "quantity constraint models" is crucial. As stated in section Ⅲ, it is not for explicating Keynsian equilibrium but for exploring the validity of the Walrasian price mechanism that we employ a "quantity constraint model". Our analysis is based not on a dynamic stochastic general equilibrium (DSGE) model but on a static model, because analyses regarding spillover effects become technically impossible in DSGE models, and the analytical results would not change in such models.

If the price mechanism does not function, particularly under deflation in the Walrasian economy, then assuming sufficient flexibility of wages, prices, and real wages does not seem sensible, because the Walrasian equilibrium and the optimal state of the economy will not be realized even if sufficient flexibility exists. In such a scenario, unemployment cannot be attributed to the price aspect, i.e., to the rigidity of real wages, as emphasized by the new Keynesianism. We cannot but eventually attribute the cause of unemployment to quantitative aspects: a lack of real aggregate demand and labor demand, as Keynes emphasizes. According to Tobin (1993, p.46), in the absence of instantaneous and complete market clearing, output and employment are frequently constrained by aggregate demand. That is, "any failure of price adjustments to keep markets cleared opens the door for quantities to determine quantities." The second result that market failure in the Walrasian economy results in Keynes's unemployment equilibrium becomes possible by re-interpreting Shapiro and Stiglitz's (1984) efficiency wage model. We

modify its implication that unemployment is caused by the rigidity of real wages. Instead, an alternate interpretation is that unemployment is caused by a shortage of labor demand under rigid real wages.[3]

Although we analyze involuntary unemployment in this study, frictional unemployment is never independent of involuntary unemployment because frictional unemployment also depends on labor demand. Thus, full employment is actually the level of employment at which there is only frictional unemployment and no involuntary unemployment.

Section II empirically criticizes prevailing theories of price mechanism and unemployment based on the long-term stagnation of the Japanese economy and recent experiences of the US and Europe. Section III analyzes market failure in the Walrasian economy. Section IV elucidates Keynes's unemployment equilibrium. Section V reviews the long-run validity of the natural rate hypothesis. Section VI considers aggregate demand as a crucial factor in the long run.

II. Empirical Criticisms of Prevailing Theories

First, based on experiences of the long-term stagnation faced by the Japanese economy after the 1990s as well as that experienced more recently by the US and Europe, empirical criticisms can be made regarding the proposition that in the short run when wages and prices are inflexible, unemployment equilibrium is established, and in the long run when wages and prices are sufficiently flexible, Walrasian equilibrium occurs; in other words, as far as wages and prices are sufficiently flexible, Walrasian general equilibrium is established.

If this proposition is valid, then the question arises of why the Japanese economy experienced persistent sluggishness with high unemployment for over 10 years since the collapse of the bubble in 1990? According to the above proposition, even if an economy faces a serious depression and consequently a large excess supply in both goods and labor markets, such an influence is only

temporary. The proposition holds that within a few years, decrease in prices and real wages will lead to economic recovery, and thus the Walrasian equilibrium will be automatically realized.

Figure 1 illustrates the proposition using a dynamic aggregate demand–aggregate supply (AD–AS) model.[4] Figure 1(a) depicts the convergence process to a long-run or Walrasian equilibrium in the Japanese goods market under deflation. Even if the economy is much lower than the full employment level, Y_F, it reaches the long-run equilibrium E^W through shifts downward of dynamic AS curves (DAS) due to reductions in the expected rate of inflation. In other words, since GDP or income increases as deflation deteriorates, an economy under deflation will reach the full employment equilibrium. This is, however, entirely the reverse of the actual scenario experienced by Japan (Yoshikawa (2000)); therefore, the propositions' empirical as well as theoretical validity must be questioned. The following analysis seeks to use the Japanese case to determine a more accurate proposition.

After 1998 when (with the exception of energy and food other than alcoholic liquors) Japan's consumer price index began to decline, the index continued to decline right up through 2012 with the exception of 2008. Furthermore, Japan's GDP deflator, which is equal to the economic overall general price index, continued to decline more or less continuously up to 2012, again except for 2008 (see figure 2). Nevertheless, the GDP gap persists from 1998 up to 2012, except 2007, and the Japanese economy never reached the Walrasian equilibrium that the proposition insists (see figure 3).

Furthermore, several times in the 1998–2002 period, "deflation spiral" was prominent in Japan as concern mounted about a vicious circle of deflation and depression. Decline in the general price level forced downwards firms' business results (both sales and profits), which in turn controlled wages and employment as well as decreased households' consumption demand. This negative impact on business results also affected equipment investment

decisions as well as households' housing investments. Consequently, overall investment demand declined. In addition, when firms or individuals cannot repay their debts, banks become more cautious about new loans due to this increase in bad debts, which will accelerate the decrease in investment and consumption demand from the finance side. In this manner, the economy falls into a vicious circle wherein deflation decreases aggregate demand and deepens the depression, which in turn aggravates deflation. The late Keynesian professor James Tobin called the Walrasian equilibrium "Never Never Land," indicating that it is a destination that can never be reached.

The failure of this proposition in reality is not only evident in and specific to the Japanese economy after the 1990s. Its failure also applies to depressions experienced in other developed countries and their subsequent economic stagnation, starting with the US financial crisis that emerged in autumn 2008 as well as the Great Depression in the 1930s. Figure 1(b) depicts a convergence process to a long-run or Walrasian equilibrium in a usual goods market or the market in the US and Europe. In other words, because GDP or income increases as the rate of inflation decreases, the economy will reach the full employment equilibrium. This is, however, in contrast to the experience of the US and Europe, indicating this proposition's divorce from reality. In fact, the dynamic where continuous falls in the rate of inflation leads an economy to fall into deflation has been the common reality across the US, Europe, Japan, and others. In addition, according to the IMF estimations (2014), in the depressions experienced in developed countries and their subsequent economic stagnation, starting from the US financial crisis of 2008, large GDP gaps can be observed in the developed countries of the US and Europe even in 2014 despite large decreases in these countries' inflation rates.

III. Failure of the Price Mechanism, particularly under Deflation: Market Failure in the Walrasian Economy

This section deconstructs the validity of the price mechanism in the

Walrasian economy, the essence of this study. Before doing so, however, we examine studies insisting that the economy becomes unstable when prices are sufficiently elastic. These studies have the following crucial problem: any results claiming to prove this proposition are derived based on models that completely differ from neoclassical models that insist the existence of a perfect price mechanism. Because the neoclassical model does not accept the validity of other models, any results derived from such other models will not be able to influence neoclassical thought.

Our basic viewpoint is that examining the price mechanism's validity seems to be impossible unless it is questioned using the same framework as used in neoclassical economics. That is, the Walrasian general equilibrium supposing flexibility of wages and prices, which is the major proposition of neoclassical macro theory, must be questioned. As shown later, we pay attention to "quantity constraint models" which play a crucial role for the examination. Specifically, the quantity constraint models of Benassy (1977) and Negishi (1979) are used to demonstrate that the price mechanism is incomplete in the Walrasian economy and does not function under deflation. A key factor enabling this analysis is spillover effects under disequilibrium, which is neglected by modern macroeconomics. The above result can be explicated without expectation, but by considering the notion of expectation, the explanation becomes clearer, as shown later. No dynamic analysis is necessary because the essential premise to derive the above result lies in the existence of sufficient flexibility of wages and prices regardless of whether in the short run or long run. Rather, if we used a dynamic analysis, the analysis of spillover effects that are essential under disequilibrium would become virtually impossible.

Quantity constraint models received widespread attention as micro theoretical foundations of Keynesian economics in the 1970s in particular. However, their popularity declined rapidly at the beginning of the 1980s because they failed to establish themselves as the microtheory of Keynesian

equilibrium—a failure which will be explored in detail below. However, a general disequilibrium theory using the quantity constraint models of Benassy and Negishi underpins our analysis on the incompleteness of the price mechanism in the Walrasian economy because they provide a model to question the price mechanism's validity, as will be explained next.

The core premise of quantity constraint models is that wages and prices are assumed to be constant because price adjustments occur much more slowly 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 much more valid than that of flexibility in modern macroeconomics. The quantity constraint models pioneered by Clower (1965) distinguish between notional and effective demand. Notional demand for goods and notional supply of labor are derived from the Walrasian model of households as functions of prices of goods and labor. When the notional supply of labor is not realized, i.e., the labor market is in excess supply, households have to make dual decisions to have effective demand for goods, since notional demand for goods cannot be financed by the proceeds from the realized labor supply. Given the realized quantity of labor supply, the effective demand for goods is then derived subject to budget constraints in which the labor supply is constrained by the realized quantity. Effective demand is therefore a function not only of prices of goods and labor but also of households' realized income.

A similar idea was suggested by Patinkin (1964) for firms that face excess supply in the goods market. As demand for labor is constrained by the realized demand for output, firms have to make dual decisions to achieve effective labor demand. Benassy (1977) and Negishi (1979) combined Clower (1965) and Patinkin (1964), and they developed a general disequilibrium model of income and employment that analyzes spillover effects between both markets with excess supply or excess demand or different states.[5]

Before explaining quantity constraint models concretely, we will first discuss the criticism that quantity constraint is not compatible with the

assumption of a price taker under perfect competition. Arrow (1959) indicated that when a competitive market experiences excess supply, a competitive supplier is not a price taker facing a horizontal demand curve but a monopolist facing a downward sloping demand curve. If one wished to explicitly analyze the dynamics of price adjustment, discarding the perfectly competitive paradigm of the producer as a price taker would be necessary. However, since the purpose here lies in focusing on the reaction of economic units to given wage and price levels and analyzing the validity of the price mechanism based on such reactions, our analysis does not contradict Arrow's indication. Otherwise, quantity constraint models could not have been realized as a theoretical model in the first place.

Although Benassy (1975) formally developed a general model of quantity constraint, Negishi (1979) considered a simple example given by Benassy (1977) as explicitly revealing the implications of quantity constraint models (his explanation, however, slightly differs from that of Benassy because of his attempt to simplify the story.) Consider a short-run economy comprising two aggregated or representative agents: a consumer household and a firm. 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

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

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

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

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

Walrasian notional demand and supply from the competitive firm are

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

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

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

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

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

and

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

when the profit is considered as

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

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

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

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:

I $\quad Y^D - Y^S > 0, \quad L^D - L^S < 0$

II $\quad Y^D - Y^S < 0, \quad L^D - L^S < 0$

III $\quad Y^D - Y^S > 0, \quad L^D - L^S > 0$

IV $\quad Y^D - Y^S < 0, \quad L^D - L^S > 0.$

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

The downward sloping curve L_1L_2 shown in the figure is the equilibrium locus of the goods market, which shows the different combinations of real

wages and real balance that satisfy the condition $L_1 = L_2$. Since L_1 corresponds to the notional supply of the firm Y^S in (3) and L_2 to the notional demand of the consumer Y^D in (7) and (5), the condition $L_1 = L_2$ thus assures equilibrium in the goods market. This locus is downward sloping since L_1 is decreasing with respect to W/P in (3) while Y_2, and therefore L_2, is increasing with respect to M_0/P in (5). Any point to the left of this curve implies excess supply in the goods market since it corresponds to $L_1 > L_2$, whereas any point to the right of this curve implies excess demand in the goods market since 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. Since L_1 is the notional labor demand of the firm L^D in (3) and L_3 is the notional supply of labor L^S in (6), the labor market is cleared if $L_1 = L_3$. This locus is upward sloping since L_1 will decrease in response to an increase in W/P from (3) while M_0/W must increase in (6) to maintain the equality of L_1 and L_3 which, in view of 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 since it corresponds to $L_1 < L_3$, whereas any point to the right of this curve implies excess demand in the labor market since 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 both in the goods and labor markets. In Area IV, excess demand exists in the labor market along with excess supply in the goods market. Only at the point of intersection of the curves L_1L_2 and L_1L_3, i.e., point E^W, the Walrasian general equilibrium is established.

In the respective areas, e.g., Area II in the figure, since excess supply exists in both markets, notional supplies $Y^S = Y_1$ and $L^S = L_3$ are not realized. Since 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, $Y^{SE} = Y_1$. Since the consumer is constrained in the labor market, however, the effective demand for goods Y^{DE}

is again obtained using the budget constraint

(8) $PY^D + M = M_0 + \Pi + WL$,

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

(9) $\Pi = PY - WL$,

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

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

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

(11) $Y = Y^{DE}$.

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

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

and therefore the excess effective demand for goods is

(13) $Y^{DE} - Y^{SE} = Y_2 - Y_1$

in Area II. In the labor market, on the other hand, the effective supply L^{SE} coincides with the notional supply $L^S = L_3$ since the consumer is not constrained in the goods market, and no dual decisions are made.[6] Effective demand for labor, however, differs from the notional demand since the firm is on the long side of the goods market. The firm must base its plan regarding demand for labor on realized sales in the goods market, which is Y_2 according to (11) and (12). The effective demand for labor L^{DE} is therefore L_2. Consequently, the excess effective demand for labor is

(14) $L^{DE} - L^{SE} = L_2 - L_3$.

Since L_2 and Y_2 are the least among L_i and Y_i, respectively, in Area II and are therefore realized, excess effective supply dominates, as expected, both 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. Since the firm is on the short

side of the goods market, the 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 has, however, to make dual decisions regarding the supply of labor since it is constrained in the goods market. The effective supply of labor is again obtained by maximizing (2) subject to

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

where Y is the realized purchase of goods. This gives

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

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

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

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

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

in view of (6). Therefore, the excess effective demand in the labor market is

(19) $L^{DE} - L^{SE} = L_1 - L_3$.

In the goods market, on the other hand, the effective demand Y^{DE} coincides with the notional demand $Y^D = Y_2$; that is, $Y^{DE} = Y_2$ since the consumer is not constrained in the labor market, and there are no dual decisions.[7] Effective supply in the goods market, however, differs from the notional supply since the firm is on the long side of the labor market and has to make dual decisions on the supply of goods. The firm must base its supply plan on the realized purchase of labor, which is L_3 from (18). Therefore, the effective supply of goods Y^{SE} is Y_3. Excess effective demand in the goods market is then

(20) $Y^{DE} - Y^{SE} = Y_2 - Y_3$.

Since L_3 and Y_3 are, respectively, the least among L_i and Y_i in Area III and are therefore realized, 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. Stating the conclusion, the sign of effective excess demand is the same as the sign of notional excess demand in Area I as well as in Areas II and III. This implies that the effective excess demand for goods is positive and the effective excess demand 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, since 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 $L^S = L_3$, i.e., $Y^{DE} = Y_2$ and $L^{SE} = L_3$. The firm is, on the other hand, constrained in both markets and dual decisions have to be made regarding demand in the labor market and supply in the goods market. Effective demand in the labor market is $L^{DE} = L_2$ since the supply from the firm in the goods market is constrained at Y_2. Effective supply in the goods market is $Y^{SE} = Y_3$ since 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 since L_2 increases with an increase in M_0/P from (5) while M_0/W decreases according to (6) to keep L_3 equal to the increased L_2, and therefore W/P must increase. Any point to the left of this curve satisfies the inequality $L_2 < L_3$, and any point to the right satisfies $L_2 > L_3$. 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 (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 markets. Dual decisions repeated imply (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. In Figure 5, Area IV declines into a part of the curve L_2L_3, i.e., E^WL_3.

The Walrasian notional demand is equalized with the corresponding Walrasian notional supply in both markets only at E^W in Figure 5. 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 effective supply are equal in the two markets. However, they are by no means Keynesian underemployment equilibria since the household is not constrained and no Keynesian involuntary unemployment exists. The theory of dual decisions presupposes that the speed of quantity adjustments is much faster than that of price adjustments. Keynesian situations are, then, disequilibria in which there is effective excess supply in both the labor and goods markets. However, how can such disequilibria be considered to be Keynesian equilibria? This is the crucial limitation of quantity constraint models and the reason why these models failed to be accepted as the microtheory of Keynesian economics. As emphasized by Negishi (1979, 1980), merely assuming that wage and price adjustments are much slower in comparison with quantity adjustment is insufficient. Only when the reason why wage and price adjustments are almost negligible in the presence of excess supply in both markets is fully explained, can it be said that Keynesian equilibrium with involuntary unemployment has been truly explicated.

Although quantity constraint models thus failed to be established as the microtheory of Keynesian economics, we have now reached a point from

which we can effectively use these models to question the validity of the price mechanism in the Walrasian economy. New classical macroeconomics assumes the Walrasian general equilibrium by supposing the sufficient flexibility of wages and prices even in the short run. We analyze whether such an assumption of perfect short-run market mechanisms is really valid, particularly under deflation in the Walrasian economy.

Figure 6(a) illustrates processes by which the economy designated by a point (M_0/P, W/P) in Area II in Figure 4 converges to the Walrasian general equilibrium E^W under the supposition of the perfect flexibility of wages and prices and therefore of real wages and real balances. It is supposed 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 supposed that W/P rises in Area II and declines in Area III, the supposition is intuitively invalid and its foundation must be explained. Furthermore, the Walrasian price mechanism will not be achieved under such a supposition. (The explanation is omitted). In addition, assuming W/P = const. in Area II and III is neglected for a similar reason.

Incidentally, the Walrasian price mechanism such as in Figure 6(a) assumes that goods and labor markets are completely independent under disequilibrium, that is, entirely neglects the existence of spillover effects inevitable between both markets under disequilibrium. Therefore, the analysis regarding adjustment processes in the Walrasian economy must be based on Figure 5 taking spillover effects under disequilibrium into consideration. 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 supposition of the perfect flexibility of wages and prices and therefore of real wages and real balances.

The following explication regarding each area in Figure 6(b) is an analytical approach to explore the validity of the price mechanism in the Walrasian economy in which spillover effects under disequilibrium are considered. First, let us begin with Area II, which Keynes intended. In this area, there exists

effective excess supply in both the goods and labor markets: the area is in deflation. Therefore, it is supposed that P, W, and W/P are completely flexible downward, as stated above, to analyze the validity of the price mechanism in Area II. Consequently, a point (M_0/P, W/P) moves in a right and downward direction. Our analysis then concerns whether the economy designated by the point reaches the Walrasian general equilibrium E^W; in other words, whether effective excess supply of both goods and labor at the point decreases to zero.

The effective excess supply of goods is

$$(21)\quad Y^{SE} - Y^{DE} = Y_1 - Y_2 > 0$$
$$= F\left(L_1\left(\frac{W}{P}\right)\right) - \frac{a_1}{a_2}\frac{M_0}{P} > 0.$$

Generally, this 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 generally realized. On the other hand, since the effective excess supply of labor is

$$(22)\quad L^{SE} - L^{DE} = L_3 - L_2 > 0$$
$$= \left(L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) - \left(\text{L corresponding to } Y_2 = \frac{a_1}{a_2}\frac{M_0}{P}\right) > 0,$$

it will certainly become zero sooner or later 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. To see the point where the economy intersects the curve, it is convenient to divide this area into two parts.

Dividing Area II into subareas reflecting 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 the point 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, but a non-Walrasian equilibrium is realized. On the other hand, 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, unless a_1/a_2 is sufficiently large, the economy

never reaches the Walrasian general equilibrium, and a non-Walrasian equilibrium is realized.

As long as a_1/a_2 is sufficiently large in (21), the effects of the increase in M_0/P—that is, real balance effects—become sufficiently large, and therefore the effective excess supply of goods becomes zero. In other words, 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, like the trajectory of C or C' in Figure 6(b). Now 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 $a_1/a_2 = e_1/e_2$ since $a_1 = e_1U$ and $a_2 = e_2U$. That is, a_1/a_2 is the ratio of each elasticity defined above. Hence, only if the elasticity of demand for goods is significantly larger than the demand for money elasticity, i.e., only if consumption is profitable enough compared to money holding, the Walrasian general equilibrium will emerge.

However, such a condition is not satisfied under real deflation. In fact, the reverse situation occurs: money holding is more profitable than consumption. We can enumerate the following three points as empirical foundations that substantiate this assertion. First, in the deflationary situation such as that depicted in Area II, decreased incomes and anxiety about the future of business and employment intensify tendencies toward 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, since people'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 or the amount of money hoarded by households. Large 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"). In these situations, therefore, it cannot be expected that the Walrasian general equilibrium will be

established due to sufficiently large real balance effects. In addition, although it has been argued

that real balance effects lack effectiveness under deflation, it is difficult to find empirical results that positively support these effects.

Next, in Area III, unlike in Area II, there exists 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 entirely flexible upward to analyze the validity of the price mechanism in Area III. Consequently, a point (M_0/P, W/P) moves in a left and upward direction. Our analysis remains focused on the question of 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,

$$(23)\ L^{DE} - L^{SE} = L_1 - L_3 > 0$$
$$= L_1\left(\frac{W}{P}\right) - \left(L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) > 0$$

$$(24)\ Y^{DE} - Y^{SE} = Y_2 - Y_3 > 0$$
$$= \frac{a_1}{a_2}\frac{M_0}{P} - \left(\text{Y corresponding to } L_3 = L_0 - \frac{a_3}{a_2}\frac{M_0}{W}\right) > 0.$$

The economy will generally reach either the L_1L_3 or L_2L_3 curve. To see where the economy arrives on either curve, this area is divided into three parts as in Figure 6(b) based on the levels of M_0/P and W/P at the Walrasian equilibrium.

In the lower left subarea, the economy necessarily arrives at any point on the E^WL_3 curve except the point E^W; 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 (24), the effects of the decrease in M_0/P—that is, 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. Now, in an inflationary situation

such as in Area III in contrast with Area II, we can assume that $a_1/a_2 = e_1/e_2$ is sufficiently large: the demand elasticity of utility for goods is sufficiently larger than the demand for money elasticity; in other words, consumption is sufficiently more preferable than money holding. Empirical foundations that satisfy this condition are as follows. First, decreases in money values because of inflation make consumption more profitable than money holding. Second, since 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 $E^W L_3$ 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. Since 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, let us refer to Area I. In Area I, it is assumed that P is completely flexible upward and W is downward because of the presence of effective excess demand for goods and effective excess supply of labor. A point (M_0/P, W/P), therefore, moves in a left and downward direction. The effective excess demand for goods and the effective excess supply of labor are, respectively,

$$(25)\ Y^{DE} - Y^{SE} = \frac{a_2}{a_1+a_2}(Y_2 - Y_1) > 0$$

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

and

$$(26)\ L^{SE} - L^{DE} = \frac{a_2}{a_2+a_3}(L_3 - L_1) > 0$$

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

The economy will generally reach either the L_1L_2 or L_1L_3 curve. To see where the economy arrives on each curve, it is convenient to divide this area into a left and right subareas vis-à-vis M_0/P at the Walrasian equilibrium.

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 can trace one of three trajectories because a_1/a_2 in (25) is supposed to larger than in Area II but smaller than in Area III.

The above analyses on the validity of the price mechanism in the Walrasian economy thus show that the price mechanism is significantly incomplete in a short-term Walrasian economy and does not function, particularly under deflation. Furthermore, it is demonstrated 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, but since it is not the Walrasian equilibrium, the Pareto-optimum state is not realized. It is therefore a market failure of the macro Walrasian economy that the price mechanism does not fully function but is incomplete at the macro level. Thus, assuming that the price mechanism at the micro level holds as it does in the macro level can be considered to be a fallacy of composition. Thus, the analysis presented above can be considered to be the basis for an argument that macroeconomics has its own theoretical paradigm that differs from that of 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.

IV. Quantitative Aspect as the Cause of Unemployment: Lack of Aggregate Demand and Keynes's Unemployment Equilibrium

The preceding section demonstrated that the price mechanism is clearly incomplete at the macro level and does not realistically function, at least under deflation. Following on from that argument, this section indicates the existence of Keynes's equilibrium with involuntary unemployment.

However, it is necessary to understand the earlier studies of Keynesian equilibrium. These studies have the following inherent drawbacks. That is, to evaluate the perfect price mechanism, as in Section III, the validity of the

Walrasian general equilibrium assuming wage and price flexibility must be reexamined. However, it must be first studied within a framework similar or identical to the neoclassical approach; otherwise, any analyses of the Keynesian equilibrium will not be sufficient to invalidate the neoclassical principle of the perfect price mechanism.

Returning to the cause of unemployment, the focus of this section, it can be said that 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 real-wage flexibility does not make inherent sense. Conversely, reasons for real-wages rigidity should be offered. It is empirically well known that real wages are indeed more stable than money wages.

However, the cause of unemployment is not attributed to real-wage rigidity as stated by the new Keynesianism. This is because, as demonstrated above, supposing real-wage flexibility is invalid. It is, therefore, logical that Keynesianism eventually attributes unemployment to the quantitative aspect: a shortage of real aggregate demand and labor demand, as stated by Keynes. Indeed, this can be confirmed by unemployment models of the new Keynesianism, which explain the rigidity of real wages. Thus, by re-interpreting an existing theory to explain the cause of unemployment as being the shortage of demand, there is no need to construct a novel model. As shown later in terms of the Shapiro–Stiglitz model, dynamic analyses are employed to explain Keynesian unemployment equilibrium, but the element of expectation is not needed.

In the following, we examine new Keynesian theories of unemployment to show that the shortage of demand is the cause of unemployment. New Keynesianism holds that involuntary unemployment is generated because real wages are for some reason sticky at a higher level than at their equilibrium level, and therefore they are not adjusted below it. The new Keynesianism models develop efficiency wage theory and insider–outsider theory based on

the root causes of real-wage stickiness. This study adopts one of the most prominent efficiency wage models as new Keynesian theories of involuntary unemployment—the Shapiro–Stiglitz model—which has attracted great attention.[8]

The Shapiro–Stiglitz (1984) focuses on the possibility that firms' limited monitoring abilities force them to provide their workers with an incentive to exert effort. The model is the most rigorous theoretically among efficiency wage models. Romer (2012) summarizes it as follows.

The economy comprises a large number of workers, $\bar{L}$, and a large number of firms, N. The workers maximize their expected discounted utilities, and firms maximize their expected discounted profits. For simplicity, the analysis focuses on steady states.

The representative worker's lifetime utility is

$$(30)\quad U = \int_0^{\infty} e^{-\rho t}\, u(t)dt \qquad \rho > 0,$$

where u(t) is instantaneous utility at time t, and ρ is the discount rate. Instantaneous utility is defined as

$$(31)\quad u(t) = \begin{cases} w(t) - e(t) & \text{if employed} \\ 0 & \text{if unemployed,} \end{cases}$$

where w is the real wage, and e is the worker's effort. Only two possible effort levels exist: e = 0 and e = $\bar{e}$. Thus, at any moment, a worker must be in one of three states: employed and exerting effort (denoted E), employed and not exerting effort (denoted S, for shirking), or unemployed (denoted U).

A key ingredient of the model is its assumptions concerning workers' transitions between these three states. First, there is an exogenous rate at which jobs end. Specifically, if a worker begins working in a job at some time t_0 (and if the worker exerts effort), the probability that the worker is still employed in the job at some later time, t, is

$$(32)\quad P(t) = e^{-b(t-t_0)} \qquad b > 0.$$

Processes like (32) are known as Poisson processes. Under such processes, the probability of job breakup is b per unit of time because (32) implies

$P'(t)/P(t) = -b.$

The second assumption concerning workers' transitions between states is that firms' ability to detect workers who are shirking is also a Poisson process. Specifically, it is assumed that detection occurs with probability q per unit of time, and it is independent of job breakups. Workers who are caught shirking are fired.

Third, unemployed workers find employment at rate a per unit of time. Each worker takes a as given. In the economy as a whole, however, a is determined endogenously.

A firm's profits at time t are

(33) $\Pi(t) = F(\bar{e}L(t)) - w(t)\,[L(t) + S(t)] \quad F' > 0,\ F'' < 0,$

where L is the number of employees who are exerting effort, and S is the number who are shirking. The problem facing the firm is to set w sufficiently high so that its workers do not shirk, and to choose L. Because the firm's decisions at any date affect profits only at that date, the firm chooses w and L at each moment to maximize the instantaneous flow of profits.

The final assumption of the model is that $\bar{e}\,F'(\bar{e}\bar{L}/N) > \bar{e}$. This condition states that if each firm hires 1/N of the labor force, $\bar{L}$, the marginal product of labor in full employment exceeds the cost of exerting effort. As will be shown later, this means that there is full employment in the absence of imperfect monitoring.

Let V_i denote the "value" of being in state i (for i = E, S, and U). That is, V_i is the expected value of discounted lifetime utility from the present moment forward for a worker in state i. Because we focus on steady states, the V_i's are constant over time. Instead of using dynamic programming to find V_E, V_S, and V_U, an intuitive approach is employed for saving space.

Consider an asset that pays dividends at rate $w - \bar{e}$ per unit of time when the worker is employed but pays no dividends when the worker is unemployed. In addition, assume that the asset is being priced by risk-neutral investors with required rate of return ρ. Since the expected value of discounted lifetime

dividends of this asset is the same as the worker's expected value of discounted lifetime utility, the asset's price must be V_E when the worker is employed and V_U when the worker is unemployed. For the asset to be held, it must provide an expected rate of return of ρ. That is, its dividends per unit time, plus any expected capital gains or losses per unit time, must equal ρV_i. When the worker is employed, dividends per unit time are $w - \bar{e}$, and there is a probability b per unit of time of a capital loss of $V_E - V_U$. Thus,

(34) $\rho V_E = (w - \bar{e}) - b(V_E - V_U)$.

If the worker is shirking, the "dividend" is w per unit of time, and since the respective probabilities of job breakups and detection are b and q per unit of time, the expected capital loss is $(b + q)(V_S - V_U)$ per unit of time. Thus,

(35) $\rho V_S = w - (b + q)(V_S - V_U)$.

Finally, if the worker is unemployed, the dividend is 0 and the expected capital gain (assuming that firms pay sufficiently high wages that employed workers will exert effort) is $a(V_E - V_U)$ per unit of time. Thus,

(36) $\rho V_U = a(V_E - V_U)$.

The firm must pay enough that $V_E \geq V_S$; otherwise, workers exert no effort and produce nothing. Simultaneously, since effort cannot exceed $\bar{e}$, there is no need to pay any excess over the minimum needed to induce effort. Thus, the firm chooses w so that V_E just equals V_S[9]:

(37) $V_E = V_S$.

Equations (37), (34), and (35) imply the following:

(38) $V_E - V_U = \bar{e}/q$.

Equations (34), (36), and (38) imply that the wage must be

(39) $w = \bar{e} + (a + b + \rho)(\bar{e}/q)$.

To substitute employment per firm, L, for the rate at which unemployed workers find jobs, a, in (39), we can use the fact that since the economy is in steady state, movements into and out of unemployment must balance. The number of workers becoming unemployed per unit of time is NLb, where b is

the rate of job breakups, and the number of unemployed workers finding jobs is $(\bar{L} - NL)a$. Equating these two quantities yields

$$a = NLb / (\bar{L} - NL).$$

Substituting this into (39) yields

$$(40)\quad w = \bar{e} + \left(\rho + \frac{\bar{L}}{\bar{L} - NL} b\right)(\bar{e}/q).$$

Equation (40) is the no-shirking condition. It shows, as a function of the level of employment, the wage that firms must pay to induce workers to exert effort. The wage needed to deter shirking is an increasing function of employment. At full employment, unemployed workers find work instantly, and thus there is no cost to being fired and no wage that can deter shirking. The set of points in (NL, w) space satisfying the no-shirking condition (NSC) is shown in Figure 7.

Next, equation (33) implies that when its workers are exerting effort, a firm's flow profits are $F(\bar{e}L) - wL$. Thus, the condition for the marginal product of labor to equal the real wage is

$$(41)\quad \bar{e}F'(\bar{e}L) = w.$$

The conventional labor demand curve satisfying (41) is also shown in Figure 7. Labor supply is horizontal at $\bar{e}$ 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 above assumption that the marginal product of labor at full employment exceeds the disutility of effort $(\bar{e}F'(\bar{e}\bar{L}/N) > \bar{e})$ implies that the Walrasian equilibrium occurs at Point E^W in the diagram.

With imperfect monitoring, equilibrium occurs at the intersection E of the L^D curve and the NSC locus. At this equilibrium, unemployment exists. Because wages are determined at the level of equilibrium and not adjusted below it, this unemployment persists even in equilibrium.

However, as demonstrated in Figure 7, the Shapiro–Stiglitz model holds that unemployment is not created because real wages are sticky at a level of

equilibrium. In fact, as stated in the following, unemployment arises due to a shortage of aggregate demand and labor demand. If aggregate demand and labor demand is sufficient, unemployment does not emerge. In Figure 7, the L^D curve will shift depending on business situation or the level of aggregate demand. The higher the level of aggregate demand, the more to the right-hand side the L^D curve is located, and thus the unemployment becomes lower (correspondingly, real wages rise). In contrast, the lower the level of aggregate demand, the more to the left-hand side the L^D curve is located, and thus the higher unemployment becomes (correspondingly, real wages decline). This indicates that the cause of unemployment is not the rigidity of real wages, as the new Keynesian insists, but the shortage of real aggregate demand and labor demand, as Keynes emphasized. This conclusion does not contradict the moderate procyclical property of real wages.[10]

Incidentally, referring to the point of 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. Therefore, it may be an effective improvement to re-examine the model based on a more valid implication about the determinants of the efficiency wage. The other point concerns the theoretical problems with *bonding* and *job selling* indicated by Carmichael (1985). Regarding these problems, we will examine in a future work.

Finally, this section critically analyzes an empirical study based on RBC models concerning the long-term stagnation of the Japanese economy after the 1990s. The study analyzed the slump of Japan's GDP in the 1990s based on the RBC model. 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 in 1990s as a reflection of technical progress can be considered to be the primary cause of the Japanese economy's long-term stagnation The same conclusion has been found not only in Japan

but also in many long-term deep recessions around the world. According to our analysis in Section III, however, the price mechanism does not actually function under deflation in the Walrasian economy. Therefore, such a conclusion derived from the RBC model—in which the fully functional price mechanism is a major premise—is unlikely. The decline in the TFP growth rate cannot therefore be identified as the primary cause of the long-term stagnation. Conversely, the long-term slump due to decreases in aggregate demand decreased the TFP growth rate. According to Basu (1996), cyclical variations of TFP measured as a Solow residual are generated not only by technical progress but also by variations in operation rates of capital and labor due to fluctuations in aggregate demand. It is, therefore, misunderstanding to interpret TFP variations as variations in technical progress alone.

Furthermore, subsequent empirical studies have sought to uncover the cause of decline in the Japanese TFP growth rate. However, the primary cause of this decline remains unclear from these empirical studies. 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 big question stated above regarding the validity of the RBC theory.

V. Validity of the Natural Rate Hypothesis: A Supposition on Long-Run Analyses

Section III, which discussed the short run when only labor was variable, showed that the price mechanism in the Walrasian economy is incomplete. In this section, the results of the short-run analysis support the argument that even in the long run, the price mechanism in the Walrasian economy will not function effectively as in the short run. Hence, we question the validity of the natural rate hypothesis as a likely supposition in long-run analyses. The long run in this study is defined in neoclassical terms. That is, 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.

Figure 8 is a neoclassical long-run equilibrium model presupposing the complete flexibility of W, P, and R (rental price of capital). In the figure, R/P is the real rental price of capital, and L_F, K_F, and Y_F are the levels of full employment of labor and capital and the level of full employment output, respectively. LRAS is the long-run aggregate supply curve in the goods market.

Extending the simple short-run model of Negishi (1979) does not lead to the Walrasian general equilibrium in this neoclassical long-run model, a state corresponding to Figure 4. The neoclassical long-run model has, however, the critical problem that it has not considered spillover effects under disequilibrium, such as those analyzed in the latter half of Section III.

The Walrasian general equilibrium in the neoclassical long-run model is the intersection, E^W, of notional demand and supply equilibrium conditions in the respective goods, labor, and capital markets: $Y^D = Y_F$, $L^D = L^S$, and $K^D = K^S$. If the model considered spillover effects under disequilibrium, it could be easily supposed from the results of short-run analysis that the economy would not be able to attain the Walrasian general equilibrium, E^W, stated above, at least under deflation.

Therefore, the following supposition holds 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 run, the price mechanism does not function generally, especially under deflation. Consequently, the natural rate hypothesis and the neutrality of money are not necessarily realized.

If this supposition is valid, then assuming the complete flexibility of W, P, and R under at least deflation even in the long run will not make inherent sense. Thus, if unemployment and idle equipment exist even in the long run, the cause cannot be attributed to the rigidity of W, P, and R. It can eventually be stated that the cause of factor underemployment lies in the quantitative aspect as well as in the short run, that is, in the shortage of real aggregate

demand as well as labor and capital demand.

At the macro level, the price mechanism is much more incomplete than previously supposed, regardless of whether the short or long run is considered. Therefore, the lack of real aggregate demand—the cause of Keynesian unemployment—will play a critical role even in the long run.

VI. Concluding Remarks

Based on the long-term sluggishness of the Japanese economy for a period exceeding 10 years since the 1990s as well as the recent US and European experiences, a big question was raised concerning prevailing theories of modern macroeconomics in terms of their explanations of the price mechanism and unemployment. Clearly, their view of the price mechanism is exceedingly incomplete in the short-run Walrasian economy and does not function, especially under deflation: market failure in the Walrasian economy. This result is explored utilizing the concept of quantity constraint models of Benassy and Negishi, which analyze spillover effects essential under disequilibrium, an aspect neglected in modern macroeconomics.

As a result of the demonstrated market failure in the short-run Walrasian economy and based on the Shapiro–Stiglitz model, we showed the existence of Keynes's unemployment equilibrium. If the price mechanism does not function, then assuming real-wage flexibility does not seem sensible, and thus the cause of involuntary unemployment cannot be attributed to the price aspect, i.e., to the real-wage rigidity, as new Keynesianism claims. Finally, it was shown that the cause of involuntary unemployment lies in the quantitative aspect, that is, in the lack of real aggregate demand and labor demand, as Keynes posited.

If the Shapiro–Stiglitz model, which explains the rigidity of real wages, is re-interpreted—that the shortage of labor demand under rigid real wages is the cause of unemployment—it becomes a powerful model for explaining involuntary unemployment. However, since the model has problems such as

lack of supporting survey evidence and *job selling*, a re-examination of old models or creation of a new efficiency wage model is needed.

A DSGE theory such as the RBC model that presupposes the perfect market mechanism even in the short run has major problems as a macrotheory. Therefore, the ability of such a model to contribute to empirical studies on long-term stagnation in Japan and around the world is unlikely.

From the results of the short-run analysis, we suppose that even in the long run, but not the ultra-long run, the price mechanism would not function, especially under deflation. Consequently, we suggested that the natural rate hypothesis in the long run and the neutrality of money would not be necessarily realized.

If this supposition is valid, then when underemployment of production factors exists even in the long run, it can be stated that the cause lies in the quantitative aspect as well as in the short run: in the shortage of real aggregate demand and labor and capital demand. This suggests that real aggregate demand should play a critical role in the long run as well as in the short run.

Finally, the suggestion that real aggregate demand should play a critical role in the long run as well as in the short run could potentially significantly impact analytical approaches used by ultra-long-run economic growth theories. Both Keynesian and neoclassical approaches agree on the point that because full employment is realized in the long run when wages and prices are flexible, economic growth in the ultra-long run is on a path to full employment growth. From the supposition in Section V, however, in the long run with flexible wages and prices, there is no need for full employment to be realized. As Yoshikawa (2000) emphasizes, therefore, even if the supply of production factors determines a growth ceiling, these are not necessarily determinants of economic growth. We consider that the paths of real aggregate demand play an important role even in the process of economic growth.[11]

Acknowledgements

The original idea of this paper was conceived more than 10 years ago. A seminar held by late professor Shozabro Fujino at the graduate school of Hitotubashi University was crucial in acquiring the idea. When I had prospects of this study, I found that having received the professor's instruction was in fact the greatest happiness as a researcher. I express my deepest gratitude here to the late respected teacher.

In addition, I am most grateful to Takashi Negishi, Emeritus Professor at the University of Tokyo and member of the Japan Academy, for his helpful comments and advice, which were more than I deserve.

Furthermore, I thank Professor Hiroshi Yoshikawa for accepting and recognizing my research as a commentator at a meeting of the Japanese Economic Association. I have also benefited from Toshiaki Hirai, Emeritus Professor at Sophia University, who has improved the interpretation of my paper through his book. Finally, I am indebted to associate professor Adam Gyenes for validating my English grammar.

Footnotes

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1 These questions are already stated in Kawai (2014). Basic Macroeconomics, Chapter Ⅰ (1) Significance of Macroeconomics, Chapter Ⅷ【column】On the Price Mechanism in Macro Economy.

2 See Dimand (2010, 2014) regarding Tobin's Keynesianism.

3 The ideas regarding the analytical approaches to the first and second results explicated above are also stated in Kawai (2014). Basic Macroeconomics, Chapter Ⅷ【column】, Chapter Ⅸ【column】On the Cause of Involuntary Unemployment.

4 N. Gregory Mankiw, *Macroeconomics, 7th ed.*, Worth Publishers, 2010, Part 4, chapter 14.

5 Benassy (1975), Malinvaud (1977), and so forth are other main literature on quantity constraint models.

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

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

8 Since insider–outsider models seem to have theoretical problems, we will discuss them elsewhere.

9 Since all firms are the same, they choose the same wage. Thus, V_E and V_S do not depend on what firm a worker is employed by.

10 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 impact of a shift in labor demand falls entirely on employment.

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

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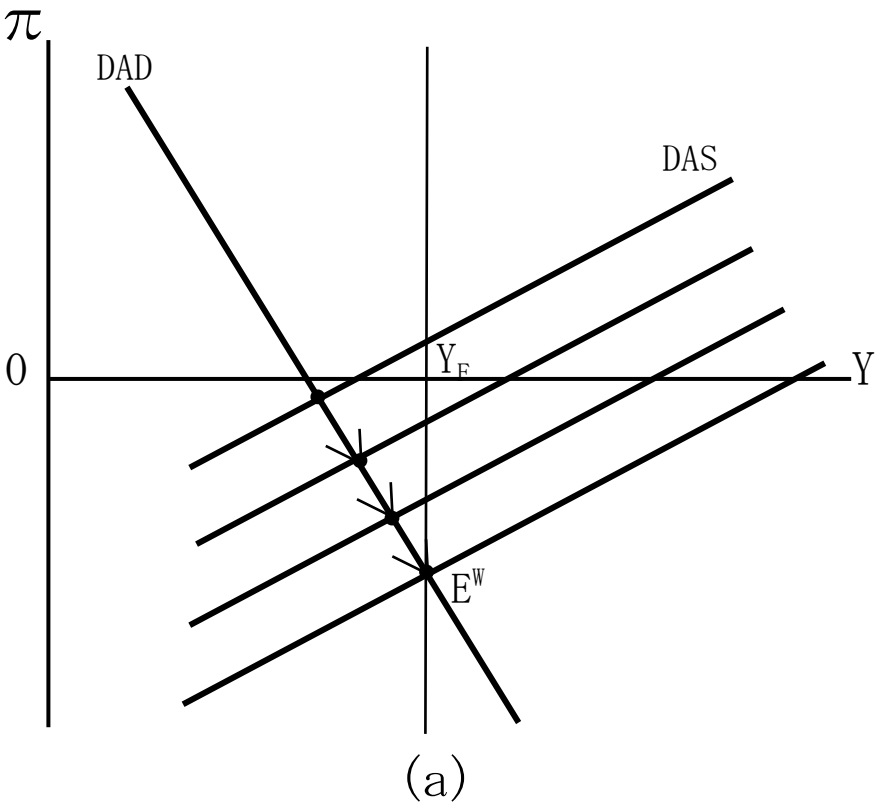
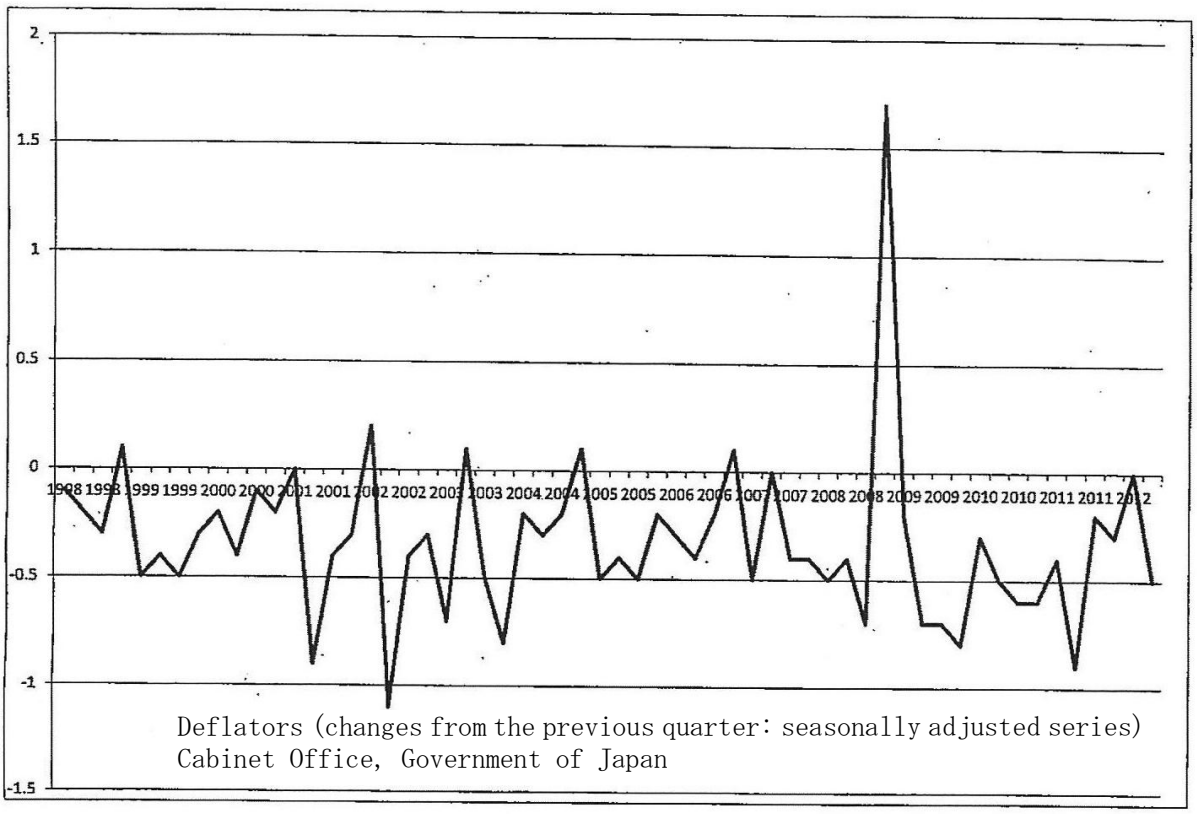


FIGURE 1. CONVERGENCE PROCESSES TO THE WALRASIAN EQUILBRIUM E^W IN A DYNAMIC AD-AS MODEL



Deflators (changes from the previous quarter: seasonally adjusted series)
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FIGURE 2. THE RATES OF CHANGE OF THE GDP DEFLATORS

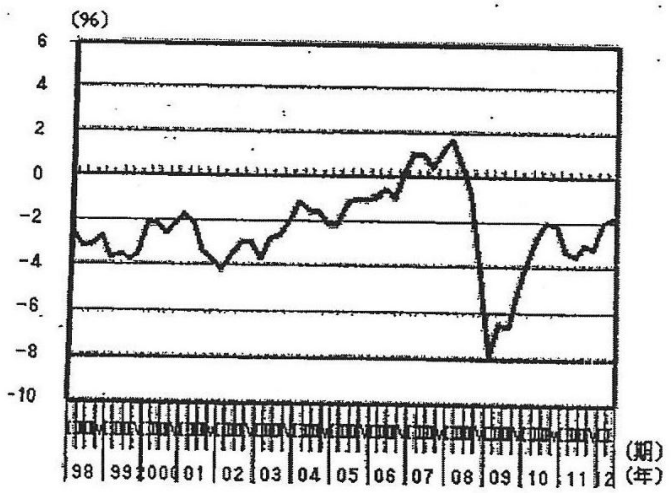

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FIGURE 3. THE TRANSITION OF THE GDP GAPS

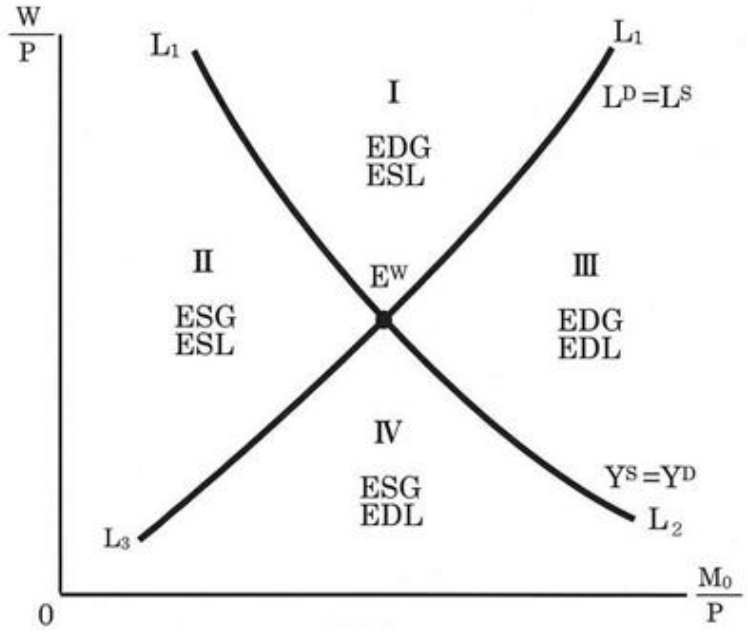

FIGURE 4. GROUPING OF DISEQUILIBRIUM COMBINATIONS OF REAL WAGES AND REAL BALANCE

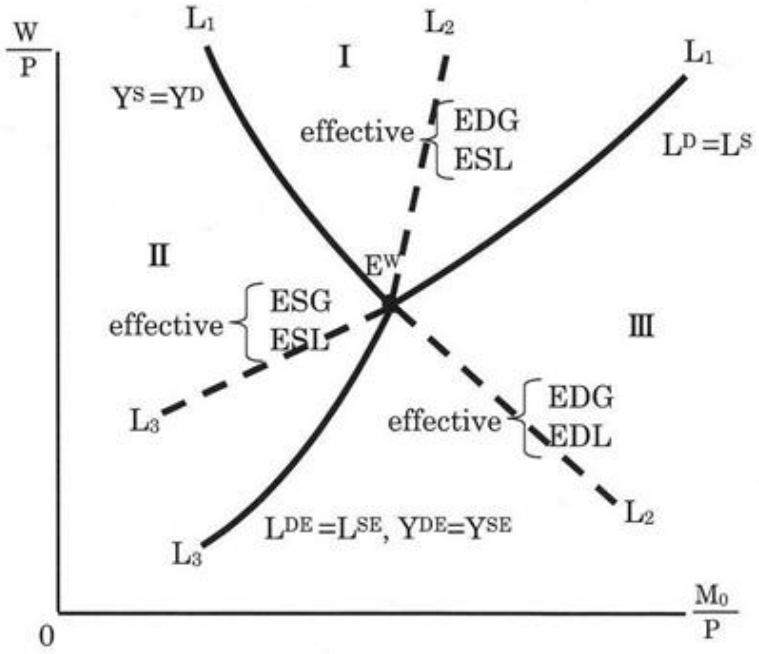

FIGURE 5. GROUPING OF COMBINATIONS OF REAL WAGES AND REAL BALANCE UNDER DISEQUILIBRIUM OF EFFECTIVE SUPPLY AND DEMAND

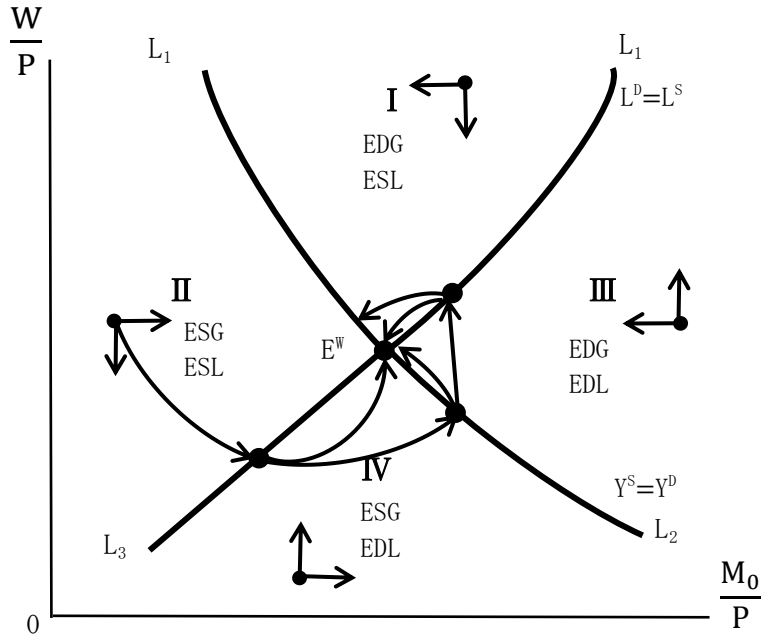

FIGURE 6(a). THE WALRASIAN PRICE MECHANISM STARTING FROM AREA Ⅱ

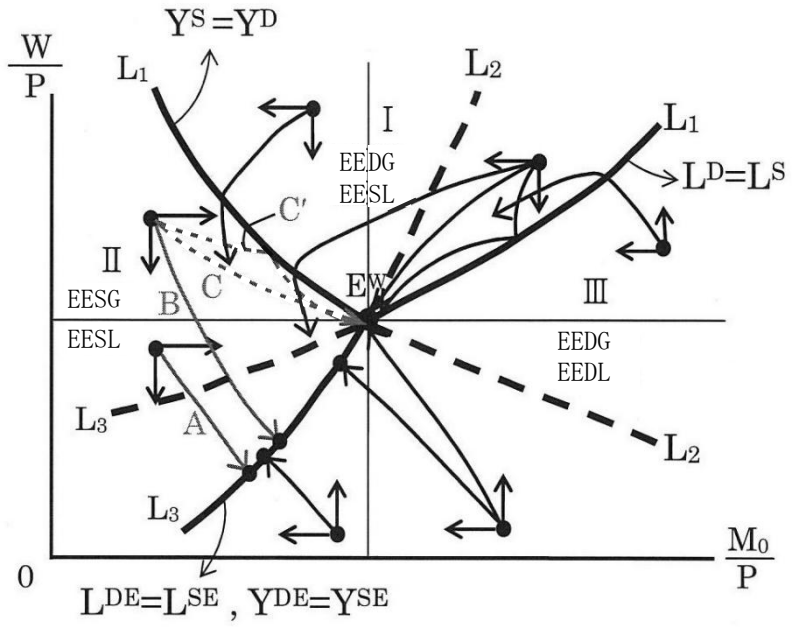

FIGURE 6(b). ADJUSTMENT PROCESSES IN A WALRASIAN ECONOMY TAKING SPILLOVER EFFECTS UNDER DISEQUILIBRIUM INTO CONSIDERATION

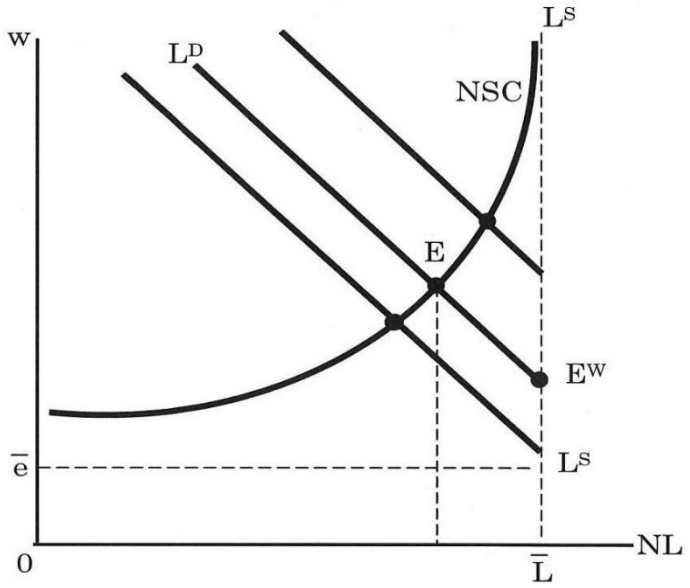

FIGURE 7. THE SHAPIRO-STIGLITZ MODEL

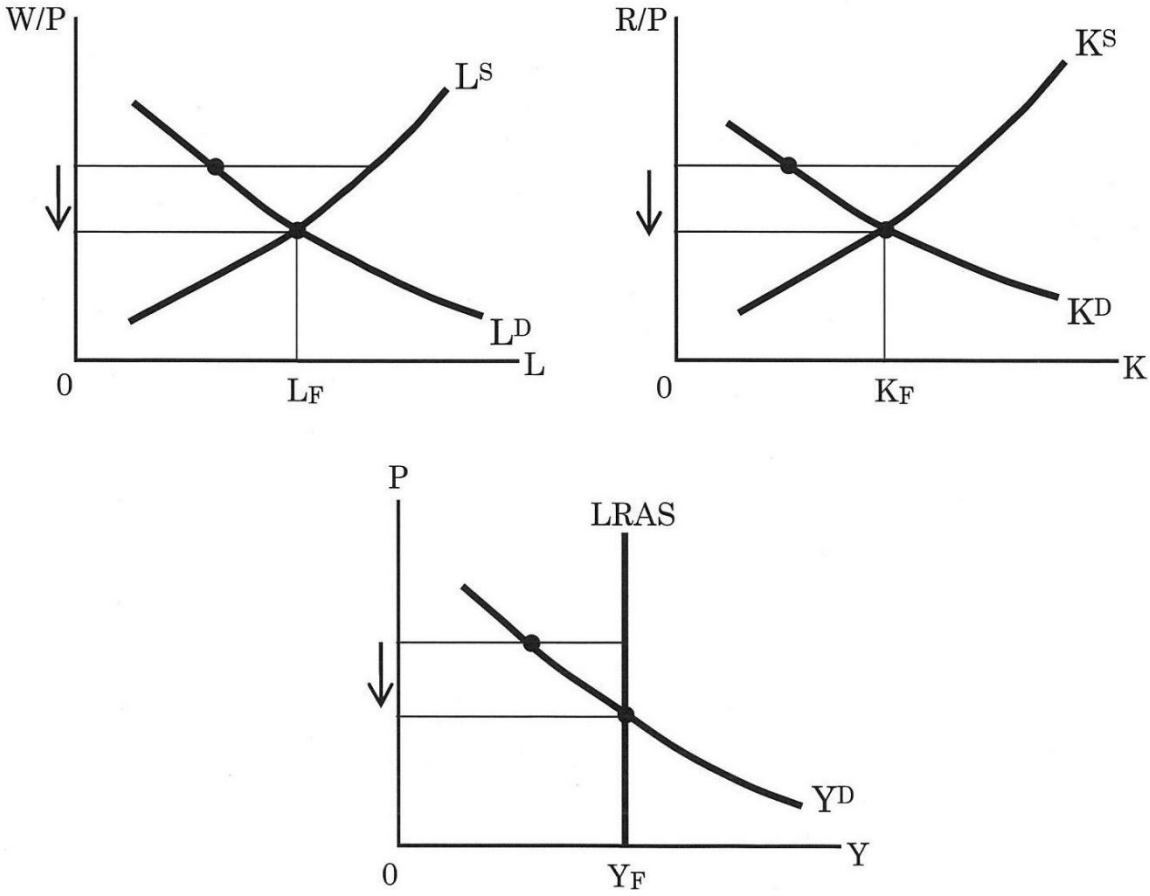

FIGURE 8. A NEOCLASSICAL LONG RUN EQUILIBRIUM MODEL