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John Maynard Keynes : Bilan et Perspectives

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The Coordination Problem and Involuntary Unemployment : from Keynes to New Keynesian Economics (First Draft)

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Abstract
This article makes an evaluation of what remains of Keynes in New Keynesian economics. The paper considers that it is not possible to keep Keynes’s theoretical framework - that is the principle of effective demand seen as an analysis of the coordination problem - separate from Keynes’s theoretical project, that is to demonstrate involuntary unemployment. In section 2, we show to what extent Keynes’s principle of effective demand is based on an inter-individual coordination problem. Then, section 3 examines if New Keynesian economics provides a modern interpretation of Keynes’s inter-individual coordination problem. The result of our analysis is twofold. One the one hand, New Keynesian economics modelizes certain part of Keynes’s theory. But, one the other hand, New Keynesian economics does not succeed to modelize involuntary unemployment à la Keynes.

Keywords: Keynes - New Keynesian Economics - Involuntary Unemployment

Résumé
Cet article propose un bilan de l’analyse de Keynes au regard de la macroéconomie contemporaine. Notre raisonnement se développe en deux étapes. Dans un premier temps, nous proposons une interprétation de Keynes fondée sur un schéma logique unifié qui établit une relation causale entre l’analyse keynésienne du problème de coordination et du chômage involontaire. Notre lecture défend l’idée qu’il n’est pas possible de séparer le cadre analytique sur lequel se fonde Keynes, à savoir la théorie de la demande effective comprise comme une analyse du problème de coordination, et son projet théorique, à savoir la démonstration d’un résultat nouveau, le chômage involontaire. A ce stade de la réflexion, nous montrons que le principe de demande effective ne relève pas seulement d’une analyse systémique mais est également érigé sur une conception du problème de coordination inter-individuelle.

Que reste-il aujourd’hui de cette structure logique fondée sur une relation causale entre problème de coordination et chômage involontaire ?

La deuxième section avance que la NMK ne propose pas d’analyse causale entre le problème de coordination et le chômage involontaire. Elle scinde ainsi le schéma analytique de Keynes en plusieurs éléments distincts, ce qui ne lui permet pas de restituer le chômage involontaire tel que Keynes l’entendait. Ainsi, le recours à la concurrence imparfaite peut servir de base à une interprétation contemporaine du principe de demande effective. Néanmoins, la concurrence imparfaite n’est pas une condition suffisante à la démonstration du chômage involontaire tel que Keynes l’entendait. De même, les modèles de défauts de coordination semblent retrouver l’esprit de la Théorie Générale, mais ne démontrent pas du chômage involontaire.
1 Introduction

What Keynes might have said about current macroeconomic thought? In order to answer to this question, it is, first of all, necessary to look at current macroeconomics and see if it differs or not from that of the 1930’s. But is difficult to compare whole current macroeconomics with Keynes. In this article, we compare New Keynesian Economics (NKE) and Keynes. At first sight, the comparison is not relevant in the sense that New Keynesian economists do not care about their filiation with Keynes.

But, even if the relation is not direct, it cannot be denied that New Keynesian economics is one of the school of thought in modern macroeconomics that evolved from the ideas of John Maynard Keynes. The label “New Keynesian” describes those economists who, in the eighties, responded to the New Classical critique with adjustments to the original Keynesian tenets. New Keynesian economists believe that market-clearing models cannot explain short-run fluctuations and so they advocate models with “sticky” wages and prices. According to Mankiw:

“New Keynesian theories rely on this stickiness of wages and prices to explain why involuntary unemployment exists and why monetary policy has such a strong influence on economic activity.”

Due to the heterogeneity of New Keynesian economics, the paper make a choice. In order to delimit the field of New Keynesian economics, we refer to Mankiw and Romer’s (1991) book. Furthermore, we will focus on New Keynesian general equilibrium models. This research strategy will help us to make an evaluation of what remains of Keynes in current New Keynesian macroeconomics.

The paper presumes that it is possible to support the thesis that Keynes offered an unified and logical theoretical framework. It does not mean that we deny all ambiguities in Keynes’ works. But we consider that it is possible to build an interpretative framework from a causal analysis between Keynes’ effective demand theory seen as a study of the coordination problem and Keynes’ concept of involuntary unemployment. Keynes’s coordination problem means that the income distributed by producers does not lead to a level of effective demand corresponding to full employment. Involuntary unemployment is a logical corollary of a level of effective demand inferior to the full employment one.

What remains in New Keynesian economics of this interpretative framework based on a causal relationship between the coordination problem and involuntary unemployment?
Then, the issue is to look at New Keynesian Economics in order to see if it provides a similar interpretative framework. The result of our analysis is twofold. On the one hand, New Keynesian economics succeeded to a certain extent to model the principle of effective demand but without linking it to an analysis of involuntary unemployment. Likewise, New Keynesian economics furnishes a modern interpretation of Keynes’ coordination problem but the coordination failures then modelized do not imply involuntary unemployment.

Section 2 will suggest an interpretation of Keynes’s coordination problem. In the *General Theory*, Keynes demonstrates why economic activities are not perfectly coordinated in market economies. Furthermore, it is generally recognised that Keynes’s main objective is to construct a theory which demonstrates the existence of involuntary unemployment. Keynes seeks to what extent the Pareto full employment equilibrium is not the only equilibrium. Section 3 will compare Keynes’s analysis with New Keynesian economics. We wonder if New Keynesian microeconomic foundations, that is mainly imperfect competition and game theory, provides a modern interpretation of Keynes’s theory of coordination failures.

### 2 A suggested interpretation of Keynes’s coordination problem

This section supports the thesis according to which macroeconomic coordination failures developed in the *General Theory* are the consequence of what we call the inter-individual coordination problem. Indeed, even if the effects of coordination failures can be appreciated at the macroeconomic level - income distributed by producers does not imply a level of effective demand corresponding to a full employment of resources - the principle of effective demand is the expression of the difficulties of coordinating agents’s expectations. We will present this interpretation in a first point. The second point will examine the implications of Keynes’s coordination problem on his analysis of unemployment.

#### 2.1 Principle of effective demand and the coordination problem

The goal of this section is to prove to what extent the principle of effective demand depends on a conception of Keynes’s coordination problem seen as an inter-individual coordination problem. We insist on the role of expectations
in order to show that Keynes’s coordination problem has clear micro foundations. By Keynes’s coordination problem, we mean that entrepreneurs form expectations which do not correspond to full employment’s expectations.

Among the existing interpretations of the principle of effective demand, there is an agreement on the fact that effective demand is the point of intersection of aggregate supply and aggregate demand, a point which leads to under-employment and where productive capacities are not fully used (L. Pasinetti, 1997). The point of effective demand is the point where the price of aggregate supply is equal to the price of aggregate demand. The key proposition is that the level of production is not determined by the availability of resources but by effective demand which determines how much of potential resources are effectively utilised.

The principle of effective demand assumes that the level of production is derived from entrepreneurs’s expectations on the level of demand:

“Any producer must try to estimate the demand that is likely to be effective before starting any production at all and quite irrespective of existing productive capacity. Disregarding this simply causes a ‘market glut’. In this sense, at any point of time it is expected demand (Keynes’ effective demand) that generates production.” (Pasinetti, 1997, pp. 100-101).

Consequently, in the short term (technology and equipment given, monetary wage rate fixed), expectations concerning the level of demand are crucial in entrepreneurs decision process because it determines the level of employment and production:

“It follows that in a given situation of technique, resources and factor cost per unit of employment, the amount of employment, both in each individual firm and industry and in the aggregate, depends on the amount of the proceeds which the entrepreneurs expect to receive from the corresponding output. For entrepreneurs will endeavour to fix the amount of employment at the level which they expect to maximise the excess of the proceeds over the factor cost.” (Keynes, 1936, pp. 24-25, we underline)

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1 “Let \( Z \) be the aggregate supply price of the output from employing \( N \) men, the relationship between \( Z \) and \( N \) being written \( Z = \Phi(N) \), which can be called the aggregate supply function. Similarly, let \( D \) be the proceeds which entrepreneurs expect to receive from the employment of \( N \) men, the relationship between \( D \) and \( N \) being written \( D = f(N) \), which can be called the aggregate demand function.” (Keynes, 1936, p. 25).
Thus Keynes’s definition of the principle of effective demand stresses the role of expectations:

“Thus the volume of employment is given by the point of intersection between the aggregate demand function and the aggregate supply function; for it is at this point that the entrepreneurs’ expectation of profits will be maximised. The value of $D$ at the point of the aggregate demand function will be called the effective demand. (Keynes, 1936, p. 25)

The principle of effective demand asserts that there is an equilibrium level of output or employment at which the proceeds of entrepreneurs are neither greater nor less than the proceeds, the expectation of which is the necessary inducement to cause the entrepreneurs to incur expenses on the scale required to produce that output. Indeed:

“Now if for a given value of $N$ the expected proceeds are greater than the aggregate supply price, i.e. if $D$ is greater than $Z$, there will be an incentive to entrepreneurs to increase employment beyond $N$ and, if necessary, to raise costs by competing with one another for the factors of production, up to the value of $N$ for which $Z$ has become equal to $D$. (Keynes, 1936, p. 25)

Entrepreneurs’s expectations do not correspond to full employment equilibrium expectations because of incomplete information which explains the difficulty for entrepreneurs to predict accurately demand from consumers. It is often recognized that Keynes insisted on uncertainty in his Quaterly article but not enough in the General Theory. Yet, this aspect is already present in this book, as we can see in the following quotation:

“An entrepreneur, who has to reach a practical decision as to his scale of production, does not, of course, entertain a single undoubting expectation of what the sale-proceeds of a given output will be, but several hypothetical expectations held with varying degrees of probability and definiteness.” (Keynes, 1936, p. 25, footnote 3).

The role of expectations is already present in Keynes’ first view about the principle of effective demand:

“In a given situation output and employment cannot increase unless entrepreneurs anticipate an increased effective demand and prepare to meet it. A false expectation will obviously improve matters for a short time, and indeed go a short way to justify itself. Nevertheless, unless the expectation is in fact soundly based, it will soon be revised. We can therefore, for practical purposes, concentrate on expectations of changes in effective demand which are soundly based. (Keynes, 1934, p. 457)
But, Keynes does not assume completely a state of uncertainty in the sentence that follows just after:

“By his expectations of proceeds I mean, therefore, that expectation of proceeds which, if it were held with certainty, would lead to the same behaviour as does the bundle of vague and more various possibilities which actually makes up his state of expectation when he reaches his decision. (ibid.)

The 1937 article stresses then the effect of uncertainty on the formation of agents’ expectations and the implications on business cycle analysis:

“The whole object of the accumulation of wealth is to produce results, or potential results, at a comparatively distant, and sometimes at an *indefinitely* distant, date. Thus the fact that our knowledge of the future is fluctuating, vague and uncertain, renders wealth a peculiarly unsuitable subject for the methods of the classical economic theory.” (Keynes, 1937, p. 113)

In particular, investment is the factor which is most prone to sudden variability because it is the factor which depends most on agents’ expectations. Investment expenditures depend on entrepreneurs’s exogeneous expectations, what Keynes calls animal spirits. It concerns effects of expectations concerning future profitability of production and their fluctuations, on investment. Animal spirits are intimately related to uncertainty. The reason for this is that animal spirits manifest themselves largely in the way that people respond to uncertainty. Future profits can not be predicted from market informations, neither determined endogeneously from the saving function. It can be assumed that entrepreneurs’s behaviours are derived from a “conventional rationality” (Keynes, 1937); but investors’s attitude can also become irrational, which explains the volatility of investment. This behaviour is rooted in entrepreneurs’s loss of confidence in future capital assets yields, which results in a loss of confidence affecting the formation of capital goods, leading finally to massive unemployment.

Those difficulties of prediction prevent entrepreneurs to take into account of positive demand externalities. Furthermore, the rate of interest does not constitute a coordinating signal of investment and saving decisions.

Firstly, entrepreneurs cannot take into account of demand externalities. They do not completely perceive that the wages they pay correspond to the consumption of their own products and of the goods of other entrepreneurs. If each producer would take into account of those externalities, he would be encouraged to produce more, to pay higher wages and thus to employ more workers. But it is difficult for an entrepreneur who is taking a decision relative to his own good market to plan perfectly both the amount produced by his
rivals and the income of consumers. A coordination problem appears because of the imperfect nature of the decision process, which reveals that individuals make a decision from expectations relative to other agents’s behaviour.

“Incomes are created partly by entrepreneurs, producing for investment and partly by their producing for consumption. The amount that is consumed depends on the amount of income thus made up. Hence the amount of consumption goods which it will pay entrepreneurs to produce depends on the amount of investment goods they are producing.” (Keynes, 1937, p. 120)

Secondly, it does not exist a price system that could coordinate agents’ expectations. Prices do not constitute a perfect signal because they do not synthesize the whole information which entrepreneurs need when they make their decision. Prices are not fixed as in the walrasian system in which they indicate to entrepreneurs how much and when to produce. In particular, the rate of interest does not coordinate perfectly saving and investment decisions. The reason also comes from a problem of coordinating agents’s expectations. Indeed, the rate of interest measures the premium which has to be offered to induce people to hold their wealth in some form other than money. And the degree of confidence - which depends on agents’ expectations - affects the formation of this premium:

“But the quantity of hoards can only be altered either if the total quantity of money is changed or if the quantity of current money income (I speak broadly) is changed; whereas fluctuations in the degree of confidence are capable of having quite a different effect, namely, in modifying not the amount that is actually hoarded, but the amount of the premium which has to be offered to induce people not to hoard.” (Keynes, 1937, p. 116, we have underlined the second part of the sentence.)

The coordination problem can then be understood according to the following argument. If effective demand determines the amount of employed factors on the labor market, the incomes distributed determine effective demand. But, effective demand failures mean that the amount of production

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3 “Now the school which believes in self-adjustment is, in fact, assuming that the rate of interest adjusts itself more or less automatically, so as to encourage just the right amount of production of capital goods to keep our incomes at the maximum level which our energies and our organisation and our knowledge of how to produce efficiently are capable of providing. This is, however, pure assumption. There is no theoretical reason for believing it to be true.” (Keynes, 1934b, p. 490)
expected by entrepreneurs is inferior to the full employment level. The coordination problem rests on the fact that individual behaviours must be coherent with other individuals’s behaviour in order to reach the full employment equilibrium. But, as Keynes said, “there is no reason in general for expecting it [the level of employment] to be equal to full employment. (Keynes, 1936, p. 28).

Coordination failures are the consequence of the inability of individuals to predict correctly and completely opportunities coming from others agents’s decisions and actions. In our view, Keynes’s coordination problem means that individuals form expectations which do not correspond to the level of full employment production. In other words, Keynes’s coordination problem assumes that the anticipations are realized but that predictions are not perfect because they do not lead to a level of production corresponding to full employment.

2.2 Coordination problem and involuntary unemployment

Our interpretation of Keynes’s coordination problem has two main implications.

The first consequence of Keynes’s coordination problem is the possibility of an under-utilization of resources, and especially labor. Indeed, effective demand failures lead to an under-employment equilibrium:

“For the mere existence of an insufficiency of effective demand may, and often will, bring the increase of employment to a standstill before a level of full employment has been reached. The insufficiency of effective demand will inhibit the process of production in spite of the fact that the marginal product of labor still exceeds in value the marginal disutility of employment.” (Keynes, 1937, pp. 30-31)

Thus, we adopt the view according to which the demonstration of involuntary unemployment is a corollary of the principle of effective demand. And, according to our interpretation, effective demand failures can be explained by a lack of coordination of agents’s expectations and decisions. If interactions between agents can lead to effective demand failures, involuntary unemployment appears as an unexpected result of interactions between individuals.

The second consequence is that involuntary unemployment cannot be attributed to wage rigidities which prevent adjustments of the real wage:

“Thus the volume of employment is not determined by the marginal disutility of labour measured in terms of real wages, except in so
far as the supply of labour available at a given real wage sets a 
maximum level of employment.” (Keynes, 1937, p. 30)

Keynes’s analysis of involuntary unemployment must not be derived from 
exogeneous assumptions concerning the working of the labor market. It would 
be an error to define involuntary unemployment in relation to the study of 
a single market, that is the labor market, since Keynes’s theory is founded 
upon a general equilibrium model of capitalistic economies.

3 Keynes’ coordination problem and NKE

This section examines what remains of Keynes’s coordination problem 
in New Keynesian economics. This section helps to understand why New 
Keynesian economics does not offer a demonstration of involuntary unem-
ployment à la Keynes. Note that it is not possible to compare whole New 
Keynesians’s works with Keynes’s theory. Thus, we focus on two New Key-
nesian theoretical foundations which seem to be the main contributions of 
New Keynesian economics to current business cycle theory: imperfect com-
petition and game theory. We wonder to what extent those microfoundations 
modelize Keynes’s analytical system which is according to us centered around 
the causal relationships between the coordination problem and involuntary 
unemployment.

3.1 Imperfect Competition and the principle of effec-
tive demand

First, let us focus on monopolistic competition. There are many differ-
ent models of imperfect competition. Models of monopolistic competition 
are now well established as standard tools in New Keynesian economics. 
Does imperfect competition model the principle of effective demand and thus 
demonstrate involuntary unemployment? Our modelling framework has the 
following characteristics:

– We focus on the analysis of imperfect competition in the goods market. 
  What explains this choice? One important consequence of the principle 
  of effective demand is that the level of employment is derived from the 
  amount produced in the goods market. Hence it could be interesting 
  to determine if the adoption of monopolistic competition in the goods 
  market in a general equilibrium model leads to the demonstration of 
involuntary unemployment.
We focus on monopolistic competition because it is the New Keynesian economics’s canonical model, in particular Blanchard and Kiyotaki (1987)’s version from which our analysis is based. What can be learnt from this model with regard to Keynes’s coordination problem? Note that our discussion concerns general equilibrium models. New Keynesian partial equilibrium models are excluded since the comparison with Keynes is then not very interesting given that Keynes’s theory is a general equilibrium one.

The whole model is not presented here because it would take too much space. In particular, the working of the labor market is not precisely analyzed. We assume a perfectly competitive labor market.

### 3.1.1 Monopolistic competition and the principle of effective demand

Let $i$ be a representative agent. He maximizes the following utility function:

$$
\max U_i = \left( \frac{C_i}{g} \right)^g \left( \frac{M_i/P}{1-g} \right)^{1-g} - \left( \frac{d}{\beta} \right) Y_i^\beta
$$

s.t.

$$
\sum_{j=1}^{n} P_j C_{ji} + M_i = P_i Y_i + \bar{M}_i \equiv I_i
$$

where:

$$
C_i = n^{\frac{1}{1-g}} \left( \sum_{j=1}^{n} C_j^{\frac{g-1}{g}} \right)^{\frac{g}{g-1}}
$$

and:

$$
P = \left( \frac{1}{n} \sum_{i=1}^{n} P_i^{1-\theta} \right)^{\frac{1}{1-\theta}}
$$

with $0 < g < 1$, $0 < \frac{\theta-1}{\theta} < 1$ et $\beta \geq 1$, $\frac{M_i}{P}$ real balances, $C_i$ the consumption index and $P$ the price index, $\bar{M}_i$ the initial monetary balances hold by agents $i$, $I_i$ the aggregate wealth. The utility function is homogeneous of degree one relative to consumption and real balances. This function is separable in consumption and real balances on the one hand and leisure on the other hand. The utility of the consumer-producer depends positively on consumption $C_i$ and real balances $\frac{M_i}{P}$, and negatively from the amount produced $Y_i$. 


Consumption $C_i$ is a function of consumption of each good $j$, $C_{ji}$. All goods enter in the utility function as (3). The function implies a constant elasticity of substitution between goods equal to $\theta$. If $\theta$ is large, goods are close substitutes.

The optimal allocation of wealth between consumption expenses and monetary balances gives the following level of consumption:

$$C_i = g \frac{I_i}{P}$$

And, from the constraint, aggregate consumption is $C_i = \frac{I_i - M_i}{P}$, which can be used to derive the value of real balances:

$$\frac{M_i}{P} = (1 - g) \left( \frac{I_i}{P} \right)$$

Demand for goods $C_i$ and demand for real balances $\frac{M_i}{P}$ are both a linear function of real wealth $\frac{I_i}{P}$.

Now, we turn to the distribution of consumption expenses between goods in order to obtain the demand function. The representative agent maximizes his consumption expenses:

$$\max_{C_{ji}} \left[ \left( \sum_{j=1}^{n} C_{ji}^{\theta - 1} \right)^{\frac{1}{\theta - 1}} \right]$$

subject to:

$$\sum_{j=1}^{n} p_j C_{ji} = I_i - M_i = E$$

The demand for each good $j$ by consumer $i$ is then:

$$C_{ji} = \left( \frac{p_j}{P} \right)^{-\theta} \left( \frac{g I_i}{nP} \right) \quad j = 1, \ldots, n \quad (4)$$

This equation determines the aggregate demand for good $j$. The demand for each good is linear of wealth and is a function of the relative price of the good, with an elasticity $-\theta$. Furthermore, the demand for real balances is also linear relative of wealth. Indeed, we know that:

$$\frac{M_i}{P} = (1 - g) \left( \frac{I_i}{P} \right)$$

$$\Rightarrow M_i = (1 - g)I_i$$

Now we explore the demand function of the producer $i$. Let $\bar{M} = \sum \bar{M}_i$ the sum of monetary balances of the economy and $M = \sum M_i$ the sum of money demands.
Each producer $i$ faces the following individual demand:

$$Y_i = \sum_{j=1}^{n} C_{ji} = \left( \frac{P_i}{P} \right)^{-\theta} \left( \frac{Y}{n} \right) = \left( \frac{P_i}{P} \right)^{-\theta} \left( \frac{g}{1-g} \right) \left( \bar{M} \right)$$

(5)

The individual demand is proportional to aggregate demand and is a decreasing function of the relative price with an elasticity $-\theta$.

Aggregate demand $Y$ is the sum of individual demands for each good $j$:

$$Y \equiv \sum_{i=1}^{n} \sum_{j=1}^{n} \frac{P_i C_{ji}}{P} = g \left( \sum_{j=1}^{n} \frac{I_j}{P} \right)$$

At equilibrium, when aggregate demand is equal to aggregate supply, total income is completely consumed so that we have:

$$\sum_{j=1}^{n} \left( \frac{I_j}{P} \right) = Y + \frac{\bar{M}}{P}$$

From the preceding equations, it is possible to derive aggregate demand which is defined by a simple relation between nominal balances, the price level and aggregate demand:

$$\sum_{j=1}^{n} \left( \frac{I_j}{P} \right) = g \left( \sum_{j=1}^{n} \frac{I_j}{P} \right) + \frac{\bar{M}}{P}$$

$$Y = \left( \frac{g}{1-g} \right) \frac{\bar{M}}{P}$$

The aggregate supply function can be derived from the representative producer programme. He chooses his production and price levels taking given the demand function. The general equilibrium of the economy is then used to understand the working of the aggregate economy.

**Price and production decisions** Each producer maximizes his profit function subject to his individual demand function in order to obtain the price $P_i$ and the production $Y_i$. We adopt a linear production function which depends only on labor and which has constant return:

$$Y_i = L_i$$

The representative producer maximizes his profits:

$$\max_{P_i} \Pi_i = P_i Y_i - WL_i = (P_i - W)Y_i$$

s.t.

$$Y_i = \sum_{j=1}^{n} C_{ji} = \left( \frac{P_i}{P} \right)^{-\theta} \left( \frac{Y}{n} \right)$$

(7)
The first order condition gives the equilibrium price rule:

\[ 0 = (1 - \theta)P_i^{\theta} - W[-\theta P_i^{-\theta-1}] \]

\[ P_i^* = \frac{W\theta}{\theta - 1} \equiv P^* \]

Given the assumption of a representative agent and that individual demands for good \( j \) are symmetrical, this price is the optimal price of all agents, and thus it defines a symmetrical Nash equilibrium. From the equilibrium price rule, we derive the producer price as a function of real wages:

\[ \frac{P^*}{P} = \frac{W\theta}{P \theta - 1} \]

It is also possible to derive the equilibrium wage rule from the price rule:

\[ \frac{W}{P^*} = \frac{\theta - 1}{\theta} \]

(8)

The equilibrium on the labor market allows us to derive the value of the real wage:

\[ \frac{W}{P} = \left[ \left( \frac{\theta - 1}{\theta} \right) Y \right]^{\frac{\beta - 1}{\beta}} \]

The substitution of this value of the real wage in (8) gives the following price rule:

\[ \frac{P^*}{P} = \left( \frac{\theta - 1}{\theta} \right)^{\frac{1}{\beta}} \cdot Y^{\frac{\beta - 1}{\beta}} \]

Given symmetry between agents, all producers apply the same price at the general equilibrium. The index price is then equal to this common price: \( P^* = P \). Thus the relative price is equal to 1. From the equilibrium price rule, we can derive the equilibrium aggregate product:

\[ Y = \left( \frac{\theta - 1}{\theta} \right)^{\frac{1}{\beta - 1}} \]

(9)

The main contribution of imperfect competition is to modelize to a certain extent the principle of effective demand. This principle is rooted on the idea that entrepreneurs form expectations about the individual demand they will face, expectations which depend on the level of aggregate demand. And the important difference between imperfect competition and walrasian theory is that firms must base their production and employment decisions from conjectures concerning the slope and the localization of their demand curve.
Even when the number of firms is enough important so that oligopolistic dependencies are negligible, each firm must form expectations on the demand of his industry and consequently on aggregate demand.

Furthermore, it is possible in this kind of model to take into account of an income effect. Indeed, the equation of aggregate demand depends on real balances $\bar{M}/P$, which themselves are function of aggregate wealth. Thus the stake of imperfect competition is linked to the variable aggregate wealth which is at the origin of a multiplier effect present in the aggregate demand function. From a theoretical point of view, at the imperfect competition general equilibrium, the demand constraint of a representative firm can be released by an increase of aggregate demand combined with a global increase of production. Or the other way round if aggregate demand works as an additional constraint on individual demand so that aggregate production and employment decrease.

This aggregate demand externality explains why changes in prices have externalities, that is effects that go beyond the firm and its customers. For instance, a price reduction by one firm benefits other firms in the economy. When a firm lowers the price it charges, it lowers the average price level slightly and thereby raises real income (nominal income is determined by the money supply). The stimulus from higher income, in turn, raises the demand for the products of all firms. This macroeconomic impact of one firm’s price adjustment on the demand for all other firms’s products is called an “aggregate demand externality”.

Consequently, imperfect competition allows a clear meaning to effective demand failures: when the individual demand curve is too weak. Effective demand deficiencies are the cause of weak activity equilibrium characterized by under-employment.

3.1.2 Imperfect competition and involuntary unemployment

If imperfect competition on the goods market modelize to a certain extent the principle of effective demand, it does not demonstrate involuntary unemployment. Indeed, the main results of the introduction of imperfect competition in macroeconomics are the following.

Firstly, imperfect competition leads to inefficiency. The macroeconomic equilibrium is inefficient in so far as the representative firm would like to produce more in the case of an increase of demand, to the current prices and wages. In this case, the representative household would like to increase his labor supply faced with a rise of labor demand. Thus, when prices and wages are given, an increase of production and employment improves both firms profits and households utilities. It has to be noted that this inefficiency
is evaluated in comparison to the walrasian level. The inefficiency of the imperfect competition equilibrium is stronger than the Pareto inefficiency since exchanges are supposed to be constrained by the equilibrium price-wage system although such a constraint is not necessary to prove Pareto inefficiency (J.P. Benassy, 1987). Consequently, when the economy become more and more competitive, production, employment and welfare increase.

Secondly, *imperfect competition in itself does not demonstrate unemployment, and even less involuntary unemployment*. If the labor market is perfectly competitive, employment exchanged in this market corresponds to a given amount of worked hours. An increase of production gives rise to an increase of labour demand. But it does not mean that unemployed workers will find a job. It does only mean that current employed workers will work more and, consequently, increase their welfare. Under-employment means in this case that the level of employment is inferior to the walrasian level. But, there is no unemployment.

The reason for this is that New Keynesian imperfect competition models do not completely take into account of Keynes’s coordination problem for several reasons.

Most New Keynesian models are built upon Dixit-Stiglitz competition framework. In this kind of models, producers choose the optimal price under the constraint of the demand function, *taking aggregate income as given*. This assumption is peculiar to this model, linked to the postulate according to which agents are insignificant relative to aggregate variables. Thus, the effect of a price variation by a firm propagates equally between other firms so that this price variation has negligible effects on the demand by each competing firm. In Dixit-Stiglitz framework, the firm demand is given by a ratio: the numerator depends only on the price of the firm and the denominator can be interpreted as the index of the price of the corresponding industry (see equation (4)). A little change of price affects the numerator of the firm demand. But, given that each firm has a negligible impact on the market, this change of price does not affect the index of the price of the denominator.

The aggregate demand curve to which the representative producer face represents the sum of the individual demands of all representative producer. Thus, given the aggregation procedure peculiar to Dixit-Stiglitz monopolistic competition model, interactions between producers and thus heterogeneity of agents are ruled out. Consequently, no income effect are present: individual demand externalities are excluded during the aggregation procedure so that an individual producer can not perceive potential increases of demand by other producers.

Oligopolistic competition models could appear as a solution to this problem in so far as the number of firms is given and that strategic interactions
are included in the model. Nevertheless, New Keynesian oligopolistic competition models lead to the same conclusion because of the assumptions made.

Indeed, in the canonical model of Hart (1982), it is assumed that the marginal revenue of a firm evaluated at a point of the symmetric production is always positive, even when the quantities produced are important (that is even at prices close to 0). Consequently, when wages tend towards 0, the profit function tends towards the receipt function and the supply of goods tends towards infinite as much as the receipt is always increasing relative to quantities. Likewise concerning the labour demand.

Then, in oligopolistic models à la Hart, strategic interactions are present but the principle of effective demand is ruled out. Indeed, each producer takes into account of the wealth of individuals but the income effect so important in the principle of effective demand is not endogeneoused. By assumption, the producer faces to infinite potential profits and receipts so that it does not perceive the potential effects of demand constraints.

It explains why New Keynesian models appeal to real rigidities to explain involuntary unemployment, a strategy that appears in line with the neo-classical synthesis, and which does not correspond to Keynes’s reasoning in the General Theory. Unemployment is then not derived from a study of the goods market and consequently is not the result of a general equilibrium analysis. The origin of unemployment is the working of the labor market whose institutional structures prevent an adjustment of the real wage. According to Keynes’s view, unemployment corresponds to voluntary unemployment in this case:

“In addition to ‘frictional unemployment’, the postulate is also compatible with ‘voluntary unemployment’ due to the refusal or inability of a unit of labor, as a result of legislation or social practices or of combination for collective bargaining or of slow response to change or of mere human obstinacy, to accept a reward corresponding to the value of the product attributable to its marginal productivity.” (Keynes, 1936, p. 6).

3.2 Game theory and Keynes’s coordination problem

To what extent recent works based on coordination game theory are close to Keynes’s causal analysis between the coordination problem and involun-
tary unemployment? This section shows that those New Keynesian works make a conceptual advance because they provide a modern understanding of Keynes’s coordination problem. Nevertheless, those works does not modelize unemployment.

3.2.1 Coordination games and Keynes’s coordination problem

Patinkin already asserted in 1984 that Keynes’s thought could be modelized from game theory:

“Keynes was not predisposed to believe in natural forces that always brought agents to generate a mutually beneficial situation. Because of the uncertainty of how other react to our actions, the actual world for Keynes was one that – in a macro context – could readily lead to the “globally irrational” results of the prisoner’s dilemma; not to the rational results of the Walrasian actioneer.”
Patinkin (1984, p. 101)

Recent New Keynesian works have tried to implement this intuition from coordination game theory. For instance, the goal of Cooper and John (1988) is to build an unemployment theory alternative to new classical and traditional keynesian theories. But, in contrast to the prisoner’s dilemma, coordination games do not rest solely upon conflict between players. Instead, confidence and expectations are critical elements in the types of coordination game that we will study in this section. In particular, the possibility of coordination failures, arising from self-fulfilling pessimistic beliefs, is observed in equilibrium. The resulting inefficiencies are, in turn, quite interesting with regard to Keynes’s coordination problem. Furthermore, coordination failures are analyzed in models with clear microeconomic foundations.

To illustrate the comparison between Keynes’s coordination problem and coordination game theory, consider the following simplified game. Let $G_1$ be a two-player coordination game:

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<td>1</td>
<td>(3,3)</td>
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<tr>
<td>2</td>
<td>(0,3)</td>
<td>(4,4)</td>
</tr>
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</table>

Coordination game $G_1$

There are two pure strategy Nash equilibria in this game, the strategy profiles (1, 1) and (2, 2) and a mixed equilibrium in which each player selects action 1 with probability $\frac{1}{2}$. Those equilibrium are Pareto ranked. The

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6See the synthesis by R. Cooper (1999).
equilibrium \((2, 2)\) is Pareto dominant. Moreover, the equilibria are strict in so far as, under small perturbations of the payoffs, the set of pure strategy equilibria do not change.

The main advantage of coordination games is that it may exhibit \textit{multiple Pareto-ranked equilibria}. This gives some content to Keynes’s coordination problem which can then be represented through models with at least two equilibria ranked with regard to the levels of activities and employment, one “high” equilibrium and one “low” equilibrium. The inefficient equilibrium can be played. This result can be fruitfully compared to Keynes’s view according to which there are two main equilibria: a full employment equilibrium which corresponds to the classical tradition and an unemployment equilibrium which is characterized by involuntary under-employment of labor (A. Leijonhufvud, 1981, p. 55). Furthermore, an economy may be “stuck” at an inefficient equilibrium.

“While all agents in the economy understand that the outcome is inefficient, each, acting independently, is powerless to coordinate the activities of other agents to reach a Pareto-preferred equilibrium. So, from this perspective, a depression in aggregate economic activity arises when the economy falls into the trap of a low activity level Nash equilibrium.” (Cooper, 1999, p. IX)

The multiplicity of equilibria and thus the possibility of the selection of a Pareto dominated equilibrium derives from players’s inability to coordinate their choices in a strategic environment. Coordination failures correspond then to sub-optimal equilibria. The nature of the strategic interactions underlying the multiple equilibria has consequences for the behaviour of the economy which the game is supposed to represent. In particular, the actions of players in coordination games are strategic complements implying that increases in the level of activity of other agents create an incentive for increased activity by the remaining agent. These interactions may exist both intra and intertemporally. Furthermore, in order to rank equilibria, there must be externalities which measure the effect of an increase of all agents’s efforts on the payoff of a single agent. There is positive externalities when the payoffs of one player increase as the action chosen by the other increases. In particular, if player 1 chooses action 2, then player’s 1 payoff is higher when player 2

\[7\text{Keynes conceives even a multiplicity of equilibria:}

“That is to say, effective demand, instead of having a unique equilibrium value, is an infinite range of values all equally admissible; and the amount of employment is indeterminate except in so far as the marginal disutility of labour sets an upper limit.” (Keynes, 1936, p. 26).
selects action 2 than if player 2 selects action 1. If there are multiple Nash equilibria and positive externalities, equilibria are Pareto ranked according to the level of effort.

Note that coordination failures do not mean that one equilibrium is characterized by coordination of players’ decisions and that there is no coordination in the other one. *There is a coordination failure in so far as the equilibrium selected is not the Pareto one.* Thus, the interpretation of Keynes’s coordination problem is strongly linked to the possibility to rank equilibria relative to a criterion of efficiency. In our case, we apply the Harsanyi-Selten criterion of risk dominance because it seems very close to the conception present in Keynes’s coordination problem.

Given that the game $G_1$ is symmetric, the following reasoning is valid for each player. If the game $G_1$ is played simultaneously, each player does not know what is the strategy of the other player. The uniformity of beliefs implies that a player expects that the opponent plays each strategy with equal probability. By symmetry, the other player holds the same beliefs. If a player affects a probability $\frac{1}{2}$ to the opponent’s strategy, the expected gain of a given player when he plays the strategy 1 is:

$$3 \cdot \frac{1}{2} + 3 \cdot \frac{1}{2} = 3$$

Likewise, the expected gain of a player when he plays the strategy 2 is:

$$0 \cdot \frac{1}{2} + 4 \cdot \frac{1}{2} = 2$$

Thus, if a player is rational, he selects strategy 1 because he obtains the higher expected gain. Consequently, the equilibrium played by both agents is the risk dominant Nash equilibrium $(1, 1)$ whereas the Pareto Nash equilibrium $(2, 2)$, that is the more efficient, is not selected.

Thus, the risk dominant equilibrium is the source of the coordination problem. The link with Keynes’s coordination problem rests on the fact

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8J. Harsanyi and R. Selten (1988) distinguish a Pareto Nash equilibrium from a risk dominant Nash equilibrium. The former refers to a criterion of efficiency in terms of payoffs. The criterion of selection of the latter is risk. The origin of the risk rests on the potential loss caused by a potential change of strategy by the other player. The risk dominant Nash equilibrium is the equilibrium whose divergences from the coordination situation is the “more supportable”. This concept makes precise the idea that playing certain equilibrium strategies is riskier than playing others given the underlying strategic uncertainty of a game. Risky strategies may support the Pareto-dominant equilibrium. In this case, a tradeoff emerges between risk and return.

9Nevertheless, note that pure coordination game - games in which the couple of strategies which do not have the same index are equal to $(0, 0)$ - the risk dominant equilibrium and the Pareto equilibrium are the same. Consequently, there is no coordination failures as we have defined.
that players need a sufficient confidence in order to consider that the other player will also select the optimal strategy. But, in non cooperative games, the announcement of a player is not sufficient to compensate the degree of risk due to uncertainty.

3.2.2 Coordination games and involuntary unemployment

The preceding argument leads us to two main comments relative to the analysis of unemployment by New Keynesian works founded on coordination game theory.

Firstly, those works constitute a conceptual advance in so far as they formalize the key point of Keynes’s coordination problem. Indeed, Keynes’s coordination problem is firmly rooted in the lack of coherence of agents’s expectations. Producers do not invest the amount corresponding to the full employment level of effective demand because they are not confident about the amount of consumption they will receive in the future. In front of the risk to not sell their whole production, producers revise their investment plans downwards. This reasoning is also present in the issue of equilibrium selection in coordination games. If each player expects that the risk to deviate from the Pareto equilibrium by the other player is too important, he selects the risk dominant equilibrium which nevertheless yields a lower payoff.

Consequently, it seems possible to argue that coordination game theory provides a conceptual framework that modelizes Keynes’s coordination problem in so far as it leads to multiple equilibria with only some of them are Pareto. At the sub-optimal equilibrium, any agent finds individually advantageous to change his behaviour. Several firms should increase their demands together. Such an action would cause a distribution of income leading to an increase of aggregate demand and employment. But, any firm finds beneficial to decides first unless it is sure that the other firms will take the same action. And uncertainty prevents firms to engage in such a virtuous process.

Even during a recession, a firm cannot generate his own demand employing more workers in order to produce more because it considers that the income then distributed will be spent to the profit of other firms. Nevertheless, if all firms would employ unemployed workers, total spending then created would generate a demand which could be at the source of an increase of production and employment. But, any decentralized institution furnishes the coordination mechanism necessary to reach the perfect coordination equilibrium. In other terms, from a macroeconomic point of view, it does not exist a mechanism which can help individuals to choose the optimal coordination equilibrium.

Secondly, despite those conceptual advances relative to the analysis of
Keynes’s coordination problem, the recourse to game theory does not allow to modelize any unemployment, voluntary or involuntary. In fact, this framework does not provides any analysis of unemployment. It just could be said that the sub-optimal coordination equilibrium corresponds to an under-employment equilibrium in so far as the payoffs are lower than the payoffs of the optimal equilibrium. The sub-optimal coordination equilibrium is characterized by lower efforts from the agents, and thus by a welfare lower than at the Pareto optimal equilibrium. But lower efforts does not mean lower employment. Levels of activities (corresponding to levels of efforts) are compared but the reference criterion is not product or employment but welfare. Thus, the analysis of under-employment is very unclear.

4 Conclusion

Paradoxically, the article shows that the thesis of a filiation between Keynes and New Keynesian economics is not so inconsistent in so far as New Keynesian Economics has modeled certain parts of Keynes’s theory. In particular, New Keynesian imperfect competition models give microeconomic foundations to the principle of effective demand. And models founded upon a game theory view provides an interesting interpretation of Keynes’s coordination problem. But, New Keynesian Economics does not offer an explanation of involuntary unemployment accurate to Keynes’s one. Why?

Because New Keynesian economics does not connect its analysis of the coordination problem with a theory of involuntary unemployment. New Keynesian economics splits Keynes’s framework in two parts. The first part gives a version of Keynes’s coordination problem, either through imperfect competition or the recourse to game theory. The second part offers an explanation of unemployment with partial equilibrium models, assuming wage contracts, efficiency wages . . . . In both cases, there is no involuntary unemployment à la Keynes. In other words, New Keynesian Economics does not demonstrate involuntary unemployment à la Keynes because it does not offer a general equilibrium explanation of coordination failures in market economies.

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