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## « Mr. Keynes, the Classics and the new Keynesians: A suggested formalization »

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# **Mr. Keynes, the Classics and the new Keynesians: A suggested formalization**

Rodolphe Dos Santos Ferreira

## **Abstract :**

The paper suggests a new Keynesian model of the General Theory. A reduced form entails a diagram with three curves relating employment and the real wage, which represent the two fundamental classical postulates and the principle of effective demand. This diagram illustrates better than *IS-LM* the generality of Keynes's theory, clarifying the distinction of voluntary and involuntary unemployment. Other significant features are the role of the distribution of expected interest rates among heterogeneous agents, whether dispersed or concentrated, in shaping the *LM* curve, as well as the role of wage competitiveness constraints as a foundation of Keynes's relative wage hypothesis.

## **Keywords :**

Keynes's model, involuntary unemployment, coordination failures, liquidity trap, relative wages.

***JEL* classification :** B22, E12

# Mr. Keynes, the Classics and the new Keynesians: A suggested formalization

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## 1 Introduction

The title is a tribute to Hicks (1937) and to Leijonhufvud (1967). "In order to elucidate the relation between Mr. Keynes and the 'Classics'," Hicks "invented a little apparatus" (Hicks, 1937, p.138), which became, under the name of *IS-LM model*, an almost inescapable way of gaining access to Keynes. Yet, "this standard model appears [...] a singularly inadequate vehicle for the interpretation of Keynes's ideas" (Leijonhufvud, 1967, p.401). In its light, "the model which Keynes called his 'general theory' is but a special case of the classical theory, obtained by imposing certain restrictive assumptions on the latter"

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(*ibid.*). In the words of Hicks himself, "the General Theory of Employment is the Economics of Depression" (Hicks, 1937, p.138), rather than a generalization of classical economics as claimed by Keynes.

Leijonhufvud did unfortunately not propose an alternative model which would be better suited for the interpretation of Keynes's ideas. The aim of this paper is to try to fill this gap. Modelling the *General Theory* is not just a translation exercise. It is a way of positioning Keynes *vis-à-vis* the Classics, old and new. How legitimate is the epithet "general" identifying Keynes's theory? What in this theory is pure rephrasing of classical concepts, axioms and propositions, and what are the brand-new elements? And are such elements, if any, just newly exploited specifications of classical relations, or rather extensions and variations of classical concepts and propositions? Moreover, modelling the *General Theory* is a way of evaluating the structuring of the book. Should we take for granted Leijonhufvud's assessment that, apart from Keynes's model being "not logically watertight", "the *General Theory* was in several respects, as has frequently been said, 'a badly written book'" (Leijonhufvud, 1968, p.10)?

Keynes himself gave up building a formal model of his "general theory", not even in the rudimentary form of the "fundamental equations" of the *Treatise on Money* (Keynes, 1930) or, in the same vein, of the functions introduced in his mid-1934 drafts of the *General Theory* (Keynes, 1973, XIII, pp.439-442 and 480-484). We still find some scattered equations along different chapters of the published version, but not enough to support a complete model, however simple. Yet, in many crucial passages, Keynes is sufficiently precise to unam-

biguously suggest a formal rendering of his verbal discourse. So, we should not be surprised to find, immediately after the publication of the *General Theory*, several attempts performed in that direction, of which Hicks (1937) is the best known. I am referring to Champernowne (1936), Reddaway (1936), Harrod (1937), Meade (1937), Lange (1938) and, in the following decade, Modigliani (1944), Klein (1947a, b), Patinkin (1948, 1949).

These models, which have contributed to shape Keynesian thinking during the second third of last century as a component of a "neoclassical synthesis", exhibit some common features which make them unfit for a thorough comprehension of Keynes. First, they are highly aggregated, being consequently unable to take explicitly into account some significant instances of heterogeneity and, above all, of interactivity among agents and industries. Second, they involve perfectly competitive output markets, an assumption which obscures the reading of book I of the *General Theory*. Third, most of them simply ignore the labour market, which is incompatible with the analysis of unemployment, or else treat this market as perfectly competitive, which blurs the distinction between "voluntary" and "involuntary" unemployment. Fourth, they all refer to some common conceptual framework, of which the classical and the Keynesian models are just two different avatars, distinguished only by the specifications of the main functional relationships.

Leijonhufvud (1968) initiated a reappraisal of this theoretical edifice, claiming that Keynes "departed from the postulates of Classical doctrine on only one point", his model being "characterized by the absence of a 'Walrasian auction-

eer' assumed to furnish, without charge and without delay, all the information needed to obtain the perfect coordination of the activities (both spot and future) of all traders" (Leijonhufvud, 1968, pp.47-48; see also Leijonhufvud, 1988). With Leijonhufvud, the coordination of agents' actions and plans becomes the central theme of the Keynes vs. the Classics debate. In the classical perspective, perfect (costless, instantaneous and complete) coordination is enough to ensure the implementation of an efficient full employment equilibrium, to which the economy would promptly converge should one realistically allow for some friction. By contrast, the main message of the *General Theory* concerns the possibility for the economy of being stuck in a "bad" underemployment equilibrium, resulting from systemic *coordination failures*. This expression may mean that coordination is incomplete, not fully extending in particular to agents' plans for the future so as to ensure their mutual consistency and realizability (cf. Leijonhufvud, 1981, pp.139-140), or else that coordination is inefficient, selecting a Pareto inferior equilibrium in a context of equilibrium multiplicity (cf. Cooper and John, 1988). We shall find instances of both kinds of coordination failures in my rendering of the *General Theory*.

Coordination failures constitute one of the major themes of the new Keynesian literature, born in the 1980s (cf. Mankiw and Romer, 1991). Other characteristic themes of this literature are output, labour and financial market imperfections, in particular those associated with imperfect competition or resulting from costly and staggered price and wage adjustments, leading to nominal rigidities. However, if imperfect wage flexibility – partly assigned by

Keynes, as we shall see, to some form of coordination failure in the labour market – is indeed an important feature of his analysis, price stickiness is in fact completely absent from the *General Theory*. Now, even if my understanding of Keynes's work is certainly in agreement with a significant part, but by no means all, of the new Keynesian corpus, the systematic confrontation of the two approaches is out of my purpose, which remains focused on the opposition between Keynes and the classics. Let me just add at this point that, for reasons that will be developed in the next section, the kind of modelling I am suggesting is of the Hicksian temporary equilibrium variety, with possible unfulfilment of the expectations of future prices and quantities. By contrast, we are quite generally in presence of Hicksian equilibria over time in new Keynesian modelling, which has eventually incorporated the rational expectations framework. As a matter of fact, even among the early contributions to the new Keynesian theme of coordination failures, we already find a simple Keynes-type micro-founded model exhibiting a continuum of rational expectations underemployment equilibria (Bryant, 1983).

From the early new Keynesian literature I essentially want to retain the model of monopolistic competition in output markets that had been introduced in another context by Spence (1976) and Dixit and Stiglitz (1977), and that was adapted to international trade by Krugman (1979) and extended to macroeconomics by Rotemberg (1982), Weitzman (1985), Svensson (1986), and Blanchard and Kiyotaki (1987). Although not designed to formalise Keynes' analysis, contrary to its predecessors of the 1930s and 1940s, this model is a very convenient

way of doing so. Indeed, it first offers a disaggregated approach to output markets, allowing to take into account in a simple way the important distinction between chosen variations in individual prices and quantities and resulting variations in price and quantity indices for the whole economy. Second, these indices are here well-defined, offering an advantageous alternative to Keynes's practice of deflating nominal aggregates by the wage unit, which hinders comparisons with modern macroeconomic analysis. Third, the model makes demand for output depend not upon the sole prices, as in the Walrasian model, but also upon the level of expenditure, which clarifies the reading of book I (chapter 3 in particular, but also chapter 5) of the *General Theory*.<sup>1</sup> Last but not least, the model exactly fits the assumption of a *given degree of competition* which is explicitly formulated in the beginning of chapter 18.<sup>2</sup>

In spite of a persistent and largely widespread belief about Keynes's approach to output markets in the *General Theory*, perfect competition is there nothing but a possible limit case, when the degree of competition reaches its maximum. It is true that output market power does not play in Keynes's analysis the same prominent role as in new Keynesian macroeconomics.<sup>3</sup> The argument developed in the *General Theory* would not be significantly different under the assumption

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<sup>1</sup>Numbered chapters and books will always refer in the following to chapters and books of the *General Theory*, unless otherwise specified.

<sup>2</sup>The assumption of a *given degree of competition* appears only in the published version of the *General Theory* and was still absent from its first proof, circulated in 1935 (cf. Keynes, 1973, vol. XIV, p.502 *in fine*). Also, even if imperfect competition is already mentioned in that proof as a possible qualification to the first fundamental postulate of classical economics, the postulate has been rephrased accordingly in the final text so as to cover imperfect competition: "the wage of an employed person is equal *in value to the product* which would be lost if employment were to be reduced by one unit" becomes "... equal *to the value* which would be lost..." (cf. Keynes, 1973, vol. XIV, p.352; my emphasis).

<sup>3</sup>See Silvestre (1993) and Dixon and Rankin (1994) for surveys of the place occupied by imperfect competition in the early new Keynesian macroeconomics.



of perfectly competitive markets. It is only after the so-called "Dunlop-Tarshis observation" of the relative movements of real and money wages that Keynes (1939) considered the necessity of pushing imperfect competition in output markets to the fore, in particular by going beyond the simplifying assumption of a *given* degree of competition, independent of the output level:<sup>4</sup>

"There remains the question whether the mistake lies in the approximate identification of marginal cost with price, or rather in the assumption that for output as a whole they bear a more or less proportionate relationship to one another irrespective of the intensity of output. For it may be the case that the practical workings of the laws of imperfect competition in the modern quasi-competitive system are such that, when output increases and money wages rise, prices rise less than in proportion to the increase in marginal money cost" (Keynes, 1939, p.46).

Proceeding from output to labour markets, we find another important component of many new Keynesian models which I shall also adopt because it seems appropriate to render Keynes's analysis in chapters 2 and 19, namely the intervention of wage setting or wage bargaining unions. Keynes allusively considers the wage setting process in chapter 2, and then treats money wages as fixed until chapter 19, where the analysis of the effects of money wage adjustments becomes partly dynamic. I will however refrain from going beyond compara-

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<sup>4</sup>See d'Aspremont *et al.* (2011) on the role played by imperfect competition in the business cycle theory developed in the late Thirties, in particular in relation to the "Dunlop-Tarshis observation" and to Keynes (1939) response.

tive statics in the present analysis, referring to its dynamic counterpart in Dos Santos Ferreira and Michel (2013). The discussion of the Phillips curve, which appears in fact not to be an ingredient of Keynes's analysis, will accordingly be left to that companion paper.

The article is organized as follows. Section 2 is devoted to some methodological questions concerning the role of expectations and aggregation, which can be seen as an echo to book II of the *General Theory*. Section 3 presents the model of classical economics as viewed by Keynes. It roughly corresponds to book I. Section 4 closes the model in what is suggested to be Keynes's way, developed in books III and IV, plus chapter 19. It emphasizes coordination failures working through both the financial and the labour markets. Section 5 concludes.

## **2 Modelling the *General Theory***

The main purpose of the suggested new Keynesian formalization of the *General Theory* is not to obtain a literal translation of Keynes's verbal argument, but just to design a convenient instrument to interpret and assess Keynes's theoretical contribution. However, this instrument cannot be credible if it does not more or less fit Keynes's methodology. So, I shall start by discussing how my formalization is related to the methodological choices of book II concerning the treatment of expectations and the aggregation issues.

## 2.1 Expectations

Keynes distinguishes two types of expectations to which he successively devotes chapters 5 and 12 of the *General Theory*. "The first type is concerned with the price which a manufacturer can expect to get for his 'finished' output at the time when he commits himself to starting the process which will produce it; output being 'finished' (from the point of view of the manufacturer) when it is ready to be used or to be sold to a second party. The second type is concerned with what the entrepreneur can hope to earn in the shape of future returns if he purchases (or, perhaps, manufactures) 'finished' output as an addition to his capital equipment. We may call the former *short-term expectation* and the latter *long-term expectation*" (Keynes, 1936, pp.46-47).

Even if he may explicitly consider an arbitrary number of future dates (for instance in chapter 11, when defining the marginal efficiency of capital), Keynes basically refers to two periods, which we may call the *present* and the *future*. The present is a short enough period to justify taking in particular as given "the existing skill and quantity of available labour, the existing quality and quantity of available equipment, the existing technique, the degree of competition, the tastes and habits of the consumer, the disutility of different intensities of labour and of the activities of supervision and organisation" (Keynes, 1936, p.245). As to the future, it might in principle involve an arbitrarily long time horizon. I shall however opt for consistency and treat the two periods as of equal length. Moreover, although I will not engage in dynamics, I shall assume at the price of realism an overlapping generations structure with two classes of

consumers – *workers* and *entrepreneurs* – who live for two periods, being active when young and inactive when old. We thus obtain quite naturally the three categories of consumers appearing in the *General Theory*, since both workers and entrepreneurs become *rentiers* when retired.

Keynes's entrepreneurs form, as producers, short-term expectations about the present and, as investors, long-term expectations about the future. The two types of expectations are treated quite differently:

"Express reference to current long-term expectations can seldom be avoided. But it will often be safe to omit express reference to short-term expectation, in view of the fact that in practice the process of revision of short-term expectation is a gradual and continuous one, carried on largely in the light of realised results; so that expected and realised results run into and overlap one another in their influence. For, although output and employment are determined by the producer's short-term expectations and not by past results, the most recent results usually play a predominant part in determining what these expectations are" (Keynes, 1936, pp.50-51).

That short term expectations are revised in the light of realised results seems to point to adaptive expectations.<sup>5</sup> The present period is however viewed as long enough for producers to completely adjust their expectations to the output market equilibrium prices:

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<sup>5</sup>Errors of short term expectations and their correction process play a significant role in the short period dynamics sketched in the *Treatise on Money* (see Dos Santos Ferreira and Michel, 2013, for a suggested formalization).

"I began [...] by regarding [the] difference [between expected and actual income, due to a mistake in the short-period expectation,] as important. But eventually I felt it to be of secondary importance, emphasis on it obscuring the real argument. For the theory of effective demand is substantially the same if we assume that short-period expectations are always fulfilled. [...] I now feel that if I were writing the book again I should begin by setting forth my theory on the assumption that short-period expectations were always fulfilled; and then have a subsequent chapter showing what difference it makes when short-period expectations are disappointed (Keynes, 1937 Lecture notes, in Keynes, 1973, XIV, p.181).

By contrast, "it is of the nature of long-term expectations that they cannot be checked at short intervals in the light of realized results. Moreover, [...] they are liable to sudden revision. Thus the factor of current long-term expectations cannot be even approximately eliminated or replaced by realised results" (Keynes, 1936, p.51). In Marshallian terms, the situations considered by Keynes may be approached as *short period equilibria*, with fulfilled short term expectations, but generally not as *long period equilibria*. In Hicksian terms, they are *temporary equilibria*, not *equilibria over time*. Or, using modern terminology, the idea of a rational expectations equilibrium is unreservedly adopted by Keynes as concerns the short term, not as concerns the long term, a major difference between Keynes and the new Keynesians, who eventually integrated the full rational expectations hypothesis as one of the unquestionable traits of their

models.

## 2.2 Aggregation

Aggregation enters the stage as a road to surpass partial equilibrium analysis of a particular industry, which appears inappropriate to found a general theory of employment. Keynes discards as a false division the separation of the theories of value and money, and writes: "The right dichotomy is, I suggest, between the Theory of the Individual Industry or Firm and of the rewards and the distribution between different uses of a *given* quantity of resources on the one hand, and the Theory of Output and Employment *as a whole* on the other hand" (Keynes, 1936, p.293; Keynes's emphasis). The very opposition between the theory of the individual industry or firm on one hand and the theory of output and employment as a whole on the other suggests merging together the first two of the three layers firm-industry-economy, at least for the sake of simplicity. This is precisely what Keynes often does (for instance in chapter 20), and what I will do, in accordance with most new Keynesian models.<sup>6</sup>

Except if one is ready to embark on a fully detailed general equilibrium model, the theory of output as a whole requires some procedure of *aggregation over goods*, allowing to measure "quantities" of output for the whole economy. Chapter 4 of the *General Theory* is devoted to this question. Keynes opts for aggregation in money value, purely nominal variations being erased through

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<sup>6</sup>In some sense, the very concept of monopolistic competition implies the assimilation of firm and industry. Of course, treating all industries more or less symmetrically, again in accordance with most new Keynesian models, remains however a heroic assumption.

deflation of money aggregates by the money wage. The separation between nominal and real output variations is however blurred under this procedure by changes in the real wage. By contrast, this separation is neat in the Keynesian one-commodity models of the neoclassical synthesis, but at the price of an excessive level of aggregation. By allowing for the use of well-defined price and quantity indices, the new Keynesian model offers, as we are going to see, an acceptable compromise.

Additional difficulties stem from aggregation over producers if one wants to avoid double counting. Keynes tackles this question in chapter 6, where he introduces a concept of user cost, covering both intermediate consumption and depreciation, to be deducted from each producer's proceeds before aggregation, which is thus performed in value added and on a net basis. The new Keynesian model gets rid of this requirement by directly assuming vertically integrated industries (with capital formation but no intermediate consumption)<sup>7</sup> and by introducing a constant rate of capital depreciation, which I will take as 100% for simplicity (an innocuous assumption given the static nature of the short period model I am suggesting). Assuming identical technologies for all the producers and identical homothetic preferences over consumption goods for all consumers complete the conditions for easy *aggregation over agents*.

As a matter of fact, technologies and preferences are assumed to be con-

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<sup>7</sup>In new Keynesian models, the monopolistic sector is sometimes assumed to supply elementary intermediate goods to a competitive final sector, not directly to the consumers. Hence, the elementary goods are then the arguments of a sub-production function instead of being the arguments of a sub-utility function. The two approaches are essentially equivalent. In both cases there is no intermediate consumption in the monopolistic industries.

gruous in the sense that the model has a single composite consumption and investment good, common to all consumers and investors. This may appear as a retreat from the two-sectoral approach of some of the already mentioned early modelling essays (Hicks, 1937, Meade, 1937), where consumption and investment goods are different goods, but does not contradict Keynes's ultimate position. In a 1934 draft of the *General Theory*, we find a chapter titled "Consumption goods and investment goods" where this division is based on the importance of the interest charges in their respective production costs – clearly "a matter of degree" as Keynes readily admits (Keynes, 1973, XIII, pp.428-430). This projected chapter becomes a section of chapter 5 in the three first proofs of the book, where the division is now between consumption and capital goods, and results from the distinction between short- and long-term expectations as determinants of their respective production (Keynes, 1973, XIV, pp.396-397). This section and the very division into two kinds of goods completely disappears in the final text. More significantly still for the present discussion, the first proof formally presents expenditures in consumption goods  $D_1$  and capital goods  $D_2$  as depending upon the employment levels in two different classes of industries with specific production functions:  $D_1 = f_1(N_1)$  and  $D_2 = f_2(N_2)$  – a division which disappears from the second proof on (see Keynes, 1973, XIV, p.373-374n). These observations suggest that, during the writing of the *General Theory*, Keynes ceased at some stage to see the two-sectoral modelling of production as relevant for his purpose.

To conclude this section, let us look formally at the new Keynesian model



of monopolistic competition. A "quantity"  $Y$  of the composite good enters as an argument of the utility and production functions in the form of an aggregate of quantities  $y_j$  of each elementary good  $j \in [0, 1]$ :  $Y = \left( \int_0^1 \eta_j^{1-\delta} y_j^\delta dj \right)^{1/\delta}$ , with a parameter  $\delta \in (0, 1)$  and positive weights  $\eta_j^{1-\delta}$  such that  $\int_0^1 \eta_j dj = 1$ .<sup>8</sup> It is straightforward to verify that choosing the quantities  $y_j$  so as to maximize the aggregate  $Y$  under the budget constraint  $\int_0^1 p_j y_j dj \leq X$  (with  $p_j$  denoting the price of good  $j$  and  $X$  the expenditure on the composite good) leads to the demand function for the  $j$ -th good  $D_j(p_j) = (p_j/P)^{-1/(1-\delta)} \eta_j X/P$ . In this expression,  $\delta$  can be viewed as the *degree of competition*,<sup>9</sup> taken as given by Keynes (1936, p.245), and  $P$  as the price of the composite good, a weighted power mean of the prices  $p_j$  of the elementary goods:  $P = \left( \int_0^1 \eta_j p_j^{-\delta/(1-\delta)} dj \right)^{-(1-\delta)/\delta}$ . We thus obtain well-defined price and quantity indices  $P$  and  $Y$ , exactly decomposing aggregate money value:  $X = \int_0^1 p_j y_j dj = PY$ .

### 3 Classical economics as viewed by Keynes

In the third sentence of chapter 1 of the *General Theory*, Keynes announces that he "shall argue that the postulates of the classical theory are applicable to a special case only and not to the general case, the situation which it assumes

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<sup>8</sup>For simplicity of notation at later stages, while not for realism, I am taking the continuous version of the model, where the set of elementary goods is a continuum represented by the unit interval. For clarity of later discussion, it is also convenient to provisionally allow for asymmetry of the elementary goods (otherwise,  $\eta_j = 1$  for any  $j$ ).

<sup>9</sup>From the expression of  $D_j(p_j)$  we see that the Marshallian elasticity of the demand for the  $j$ -th good is  $1/(1-\delta)$ , which is also the (constant) elasticity of substitution between elementary goods. Under monopolistic competition among producers of elementary goods, its reciprocal  $1-\delta$  is the Lerner's index of the degree of monopoly, and  $\delta$  (the corresponding complement to one) the degree of competition.

being a limiting point of the possible positions of equilibrium" (Keynes, 1936, p.3). The statement is precise, and although it is generally understood that Keynes purports to generalize the classical theory to situations of less than full employment, not enough attention has often been paid to the formal meaning of this sentence. One possible reason for this neglect is that many readers of the *General Theory* tend either to bypass chapter 2, devoted to the "Postulates of the Classical Economics" and focused on the labour market, or at least to be satisfied with a cursory reading of it.<sup>10</sup> I shall on the contrary devote to this chapter a significant part of this section. I will conclude with Keynes's critique of Say's law in chapter 3, involving a discussion of the role of the rate of interest which is developed in chapter 14. These developments extend to the output and financial markets his appraisal of classical economics, started in relation to the labour market.

### **3.1 The first fundamental postulate: demand for labour and price setting**

The first of the two "fundamental postulates of the classical theory of employment" states, in Keynes's words, that "*the wage is equal to the marginal product of labour*" (Keynes, 1936, p.5). We are all familiar with such formulation of the first order condition for profit maximization. It is however useful to spend some time on this postulate, in particular because Keynes reminds us that "the equal-

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<sup>10</sup>Hoover (1995) is a valuable exception in providing a careful reading of chapter 2. The author suggests an efficiency wage model rationalizing Keynes's relative wage hypothesis, whereas I pursue the same objective on the basis of a wage bargaining model. We thus refer to two different brands of new Keynesian modelling of the labour market.

ity may be disturbed, in accordance with certain principles, if competition and markets are imperfect" (*ibid.*).

Acting as a producer, each entrepreneur  $j \in [0, 1]$  maximizes his profit  $p_j y_j - w_j n_j$ , where  $p_j, y_j, n_j$  are his decision variables, namely price, output and employment respectively, and where  $w_j$  is the money wage, which is taken as given at this stage. Profit maximization is performed under two constraints, requiring the output to be both feasible and vendible:  $y_j \leq F_j(n_j) \equiv A \bar{k}_j^{1-\alpha} n_j^\alpha$  (with  $A > 0$ ,  $0 < \alpha < 1$  and capital  $\bar{k}_j > 0$ , given in the short period) and, according to the expression of the demand function established in subsection 2.2,  $y_j \leq D_j(p_j) = (p_j/P)^{-1/(1-\delta)} \eta_j X/P$ . Each producer  $j$  is assumed to know the demand function  $D_j$ , and to make consistent *short term expectations* of the mean price  $P = \left( \int_0^1 \eta_j p_j^{-\delta/(1-\delta)} dj \right)^{-(1-\delta)/\delta}$ , of the aggregate expenditure  $X$  and of the exogenous component  $\eta_j$  of his market share.

The first order condition for profit maximization can be expressed as the equality of marginal cost and marginal revenue:

$$\frac{w_j}{F'_j(n_j)} = \delta p_j, \text{ with } p_j = D_j^{-1} \circ F_j(n_j). \quad (1)$$

This condition states that the price  $p_j$  is optimally set by applying to marginal cost a markup factor equal to the reciprocal  $1/\delta$  of the degree of competition. It equivalently states that "the wage of an employed person is equal to the value which would be lost if employment were to be reduced by one unit" (Keynes, 1936, p.5):  $w_j = \delta p_j F'_j(n_j)$ . Referring to the real wage  $\omega_j \equiv w_j/P$  and to the

real output  $Y \equiv X/P$ , and using the expression for the demand function  $D_j$  for good  $j$ , we can rewrite this first order condition as the first fundamental postulate in the following terms:

$$\omega_j = \delta F'_j(n_j) \left( \frac{\eta_j Y}{F_j(n_j)} \right)^{1-\delta} \equiv \Omega^I \left( \begin{array}{c} n_j, \eta_j Y \\ - \quad + \end{array} \right), \quad (2)$$

with  $\Omega^I$  decreasing in employment  $n_j$  and increasing in the level  $\eta_j Y$  of demand for the  $j$ -th good. The function  $\Omega^I(\cdot, \eta_j Y)$  is the inverse labour demand function.

Notice that, instead of proceeding from the first order condition (1) to the inverse labour demand function, we may proceed from the same condition as a price setting equation to the *aggregate supply function* of chapter 3, namely "the aggregate supply price of the output from employing N men" (Keynes, 1936, p.25):

$$\frac{p_j}{P} F_j(n_j) = \frac{1}{\delta \alpha} \omega_j n_j, \quad (3)$$

here expressed in real terms, that is, deflated by the price index  $P$ .<sup>11</sup> On the (expected) demand side, we correspondingly obtain what Keynes calls the *aggregate demand function*, that is, "the proceeds which entrepreneurs expect to receive from the employment of N men" (Keynes, 1936, p.25):

$$\frac{D_j^{-1} \circ F_j(n_j)}{P} F_j(n_j) = (\eta_j Y)^{1-\delta} F_j(n_j)^\delta. \quad (4)$$

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<sup>11</sup>The aggregate supply function is linear with respect to employment  $n_j$ , as shown in Keynes (1936), pp.55-56, n.2. This footnote, which is somewhat problematic as regards the slope which Keynes attributes to the aggregate supply line, has been discussed at length, together with its context, in Dos Santos Ferreira and Michel (1991).

In Keynes's terminology, the value of this function at the point of intersection with the aggregate supply function, is the *effective demand* (Keynes, 1936, p.25). Notice that a "representative firm"  $j^*$  setting the mean price  $p_{j^*} = P$  would choose employment  $\hat{n}_{j^*}$  so as to serve a demand  $\eta_{j^*}Y$  by supplying the corresponding output  $F_{j^*}(\hat{n}_{j^*}) = \eta_{j^*}Y$ . Thus, the value  $\eta_{j^*}Y$  unambiguously appears as the effective demand addressed to the representative firm  $j^*$ . By extension, I shall refer in the following to  $\eta_j Y$  as the effective demand for (any) good  $j$  and to  $Y$  as the effective demand, simply.

Now, observe that the aggregate demand function as defined by (4) coincides with the production function when competition is perfect (when  $\delta = 1$ ), so that what Keynes calls "effective demand" depends then on demand proper only through the mean price which is implicit in  $\omega_j = w_j/P$  and which determines the slope of the aggregate supply function. Otherwise, when competition is imperfect (when  $\delta < 1$ ), the aggregate demand function is equal to the geometric mean of the production function and of the effective demand for the producer's good. Keynes's emphasis on the role played in producers' employment decisions by the "expectations as to the sale-proceeds" of the corresponding output (Keynes, 1936, p.47) comes only then into its own.

In order to prepare the discussion of the second fundamental postulate in the next subsection, and in particular to explain the meaning of "throwing over the second postulate" while "maintaining the first" (cf. Keynes, 1936, p.16-17), as well as the semantics involved in the opposition "voluntary" vs. "involuntary" unemployment, two further remarks may be useful at this stage.

First, notice that the first fundamental postulate, as formulated by Keynes (*"the wage is equal to the marginal product of labour"*), is in fact more than the statement of the condition for profit maximization. It requires this condition to be actually satisfied in equilibrium (the wage *is* equal to the MPL, not the wage *should be* equal to the MPL for profit to be maximized). In other words, profit maximization is an equilibrium condition: in equilibrium the producer is on his labour demand curve, as defined by the first order condition.

Second, consider firm  $j$ 's aggregate supply price  $p_j F(n_j)$ , equal by equation (3) to its competitive value  $w_j n_j / \alpha$  augmented by the application of the markup factor  $1/\delta$ . Imperfect competition pivots the aggregate supply curve upwards or, equivalently, to the left: in some sense, in order to ensure the conditions for a higher price, the firm is voluntarily rationing its own sales and correspondingly curtailing in a proportion  $\delta$  the employment it creates.

### **3.2 The second fundamental postulate: labour supply and wage setting**

The second fundamental postulate states that *"the utility of the wage when a given volume of labour is employed is equal to the marginal disutility of that amount of employment"* (Keynes, 1936, p.5). In order to keep computations simple, let me assume that a worker chooses present and future consumption  $C$  and  $\hat{C}$  of the composite good, and further decides on his labour market participation  $l \in \{0, 1\}$ , in order to maximize the utility function  $\Gamma C^\gamma \hat{C}^{1-\gamma} - vl$  (with  $0 < \gamma < 1$ ,  $\Gamma = \gamma^{-\gamma} (1 - \gamma)^{-(1-\gamma)}$  and  $v > 0$ ). Utility maximization is

performed under the present and future budget constraints:  $PC + PS \leq wl$  and  $\hat{P}\hat{C} \leq (1 + i)PS$ , where  $S$  is real saving,  $w$  the money wage,  $\hat{P}$  the expected future price of the composite good and  $i$  the nominal rate of interest. As well known, optimal consumption is given, in the case of the Cobb-Douglas function  $C^\gamma \hat{C}^{1-\gamma}$ , by  $C = \gamma wl/P$  and  $\hat{C} = (1 - \gamma)wl(1 + i)/\hat{P}$ , so that  $\gamma$  is what Keynes calls the *marginal propensity to consume* (Keynes, 1936, ch.10), here taken as constant because of the Cobb-Douglas specification. For ease of notation, I shall refer to the real wage  $\omega \equiv w/P$  and to the expected real rate of interest  $\hat{r}$ , such that  $1 + \hat{r} \equiv (1 + i)P/\hat{P}$ . By substituting the expressions for optimal present and future consumption in the utility function, we obtain, for  $l = 1$ ,  $u(\omega) \equiv (1 + \hat{r})^{1-\gamma} \omega$  as the (indirect) utility of the real wage. Hence, the worker participates in the labour market only if  $u(\omega) \geq v$ , that is, if the real wage is at least equal to its reservation value:

$$\omega \geq \frac{v}{(1 + \hat{r})^{1-\gamma}} \equiv \underline{\omega}(\hat{r}). \quad (5)$$

Now, assume that there is a continuum  $[0, 1]$  of workers potentially employable by each firm, identical except for their labour disutility, which is continuously distributed over  $[0, \infty)$  with the same distribution function  $V$  for all firms. Thus, there is a set of workers of size  $V(v)$  whose labour disutility is at most equal to  $v = u(\omega)$ : the utility  $u(\omega)$  of the real wage is equal to the marginal disutility  $v$  of the amount  $V(v)$  of employment, as in Keynes's formulation of the second fundamental postulate. Each firm  $j$  faces consequently the *labour*

*supply function*

$$\Lambda(\omega) \equiv V \circ u(\omega) = V\left((1 + \hat{r})^{1-\gamma} \omega\right). \quad (6)$$

According to Keynes, "the traditional theory maintains [...] *that the wage bargains between the entrepreneurs and the workers determine the real wage*; so that, assuming free competition amongst employers and no restrictive combination amongst workers, the latter can, if they wish, bring their real wages into conformity with the marginal disutility of the amount of employment offered by the employers at that wage" (Keynes, 1936, p.11). In other words, the real wage is supposed to adjust to its market balancing value, such that labour demand  $n_j$  equals labour supply  $\Lambda(\omega_j)$  or, referring to the inverse demand for labour given by (2),  $\omega_j = \Omega^I(V \circ u(\omega_j), \eta_j Y)$ .

The second postulate is however "subject to the qualification that the equality for each individual unit of labour may be disturbed by combination between employable units analogous to the imperfections of competition which qualify the first postulate" (Keynes, 1936, pp.5-6). We must accordingly introduce collective bargaining between a *union* and the firm, "labour [...] being] in a position to decide the real wage for which it works, though not the quantity of employment forthcoming at this wage" (Keynes, 1936, p.11). In other words, bargaining concerns the sole wage, while the firm keeps its "right to manage" regarding employment. It has become usual to refer to the so-called generalized Nash solution to the bargaining problem, maximizing a weighted geometric mean of the firm's and the union's objectives (or rather of the excesses of these objectives over the respective fallbacks), with the weights reflecting the relative



bargaining powers of the two parties. For a large enough bargaining power of the firm the Nash solution coincides with the competitive equilibrium value of the real wage. In order to emphasize "the qualification that the equality for each individual unit of labour may be disturbed by combination between employable units", and also for the sake of simplicity, I shall assume the opposite limit case of a monopoly union.<sup>12</sup>

Assume for instance a utilitarian union with utility  $U(\omega_j)$  equal to the sum of workers' surpluses  $u(\omega_j) - v$ , to be maximized under the constraint  $n_j \leq N_j(\omega_j, \eta_j Y)$ , where  $N_j(\cdot, \eta_j Y)$  is the labour demand function, that is, the inverse of  $\Omega^I(\cdot, \eta_j Y)$  as defined by (2). If they are efficiently rationed, the workers are employed in the increasing order of their labour disutilities: the lower the disutility, the higher the eagerness for a job and the higher the probability of finding one. By weighting the surplus of the worker with disutility  $v$  by the corresponding density  $V'(v)$ , and integrating over the space of labour disutilities from 0 to the marginal disutility  $\bar{v}(\omega_j) \equiv V^{-1} \circ N_j(\omega_j, \eta_j Y)$  of the employment available at  $\omega_j$ , we obtain:

$$\begin{aligned} U(\omega_j) &= \int_0^{\bar{v}(\omega_j)} (u(\omega_j) - v) V'(v) dv \\ &= u(\omega_j) N_j(\omega_j, \eta_j Y) - \int_0^{\bar{v}(\omega_j)} v V'(v) dv. \end{aligned} \tag{7}$$

By a straightforward computation, we find that the first order condition for the

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<sup>12</sup>The monopoly union model was introduced in 1944 by Dunlop, a student of Keynes.

maximization of  $U(\omega_j)$  is:

$$u(\omega_j) = \frac{\bar{v}(\omega_j)}{\delta\alpha} = \frac{V^{-1} \circ N_j(\omega_j, \eta_j Y)}{\delta\alpha}. \quad (8)$$

The utility  $u(\omega_j)$  of the wage when the volume of labour  $N_j(\omega_j, \eta_j Y)$  is employed is equal, not to the marginal disutility  $\bar{v}(\omega_j)$  of that amount of employment, but to that disutility multiplied by the markup factor  $1/\delta\alpha$  (a higher degree of monopoly of the firm in the output market induces a higher degree of monopoly of the union in the labour market). This first order condition determines the real wage  $\omega_j$ , given the expected effective demand  $\eta_j Y$  for good  $j$ . However, we may equivalently refer to the employment-real wage space  $(n_j, \omega_j)$  and take the real wage as determined by the intersection of the curves representing the two fundamental postulates,  $\omega_j = \Omega^I(n_j, \eta_j Y)$  and

$$\omega_j = \frac{1}{\delta\alpha} \frac{V^{-1}(n_j)}{(1 + \hat{r})^{1-\gamma}} \equiv \Omega^{II} \left( n_j, \hat{r} \right), \quad (9)$$

with  $\Omega^{II}$  increasing in employment  $n_j$  and decreasing in the expected real rate of interest  $\hat{r}$ . Recall that the function  $\Omega^I(\cdot, \eta_j Y)$  is just the inverse labour demand function. Similarly,  $\Omega^{II}(\cdot, \hat{r})$  is the inverse labour supply function, augmented according to the markup factor  $1/\delta\alpha$ .

As the firm exercising its output market power voluntarily rations its own sales, the union exercising its monopoly power voluntarily rations potential employment, in order to keep the real wage above its competitive value (the value that balances labour demand and labour supply). Also, as emphasized with

respect to the first fundamental postulate, the second postulate states more than just the first order condition (8): it states that this condition is actually satisfied in equilibrium, in other words that in equilibrium the union is in fact on the augmented inverse labour supply curve (9). Hence, Keynes's rejection of the second fundamental postulate should by no means be interpreted as a denial of standard economic behaviour by workers and unions. It just means that, contrary to the classical viewpoint, the maximization of either workers' or unions' objectives should not be taken as an equilibrium condition, in other words, that equilibrium is compatible with workers and unions being *off their supply curves*.

### 3.3 How full is *full employment*?

In order to approach unemployment as an overall phenomenon, not limited to the micro labour market  $j$ , we must resort to general equilibrium analysis. A rough but simple way of going directly to the essentials of the question is to assume complete symmetry across output and labour markets (implying  $\bar{k}_j = \bar{k}$  and  $\eta_j = 1$  for any  $j$ ). The first fundamental postulate can then be reformulated for any market (without having to refer to index  $j$ ) in terms of the equation  $\omega = \Omega^I(n, F(n))$ , incorporating the equality  $Y = F(n)$  deduced from the binding constraints on the individual producer. We thus obtain a simple relation involving only employment and the real wage. Keynes points out a different situation as regards the second postulate: “[Classical economists] do not seem to have realised that, unless the supply of labour is a function of real wages alone,

their supply curve for labour will shift bodily with every movement of prices” (Keynes, 1936, pp.8-9). The real interest rate, an argument of the inverse labour supply function and of its augmented version  $\Omega^{\text{II}}$ , is indeed influenced by price movements either directly or indirectly (through the money rate of interest). Rather than a single curve, as in the case of the first postulate, we thus obtain in the employment-real wage space a family of curves parameterized by  $\hat{r}$ , all of them potential representatives of the second postulate.

Let us provisionally neglect the influence of  $P$  on  $\hat{r}$ , by taking the real rate of interest as exogenous. If the two fundamental postulates are simultaneously satisfied, that is, if  $\omega = \Omega^{\text{I}}(n, F(n)) = \Omega^{\text{II}}(n, \hat{r})$ , we unambiguously obtain an equilibrium pair  $(n^{\text{FE}}, \omega^{\text{FE}})$ , corresponding to a “state of affairs we shall describe as ‘full’ employment, both ‘frictional’ and ‘voluntary’ unemployment being consistent with ‘full’ employment thus defined” (Keynes, 1936, pp.15-16). Figure 1 represents in the space  $(n, \omega)$  the competitive aggregate labour demand and supply curves (the thin decreasing and increasing curves, respectively), as well as the corresponding curves modified by imperfect competition, which can be identified with the first and second fundamental postulates  $\Omega^{\text{I}}(\cdot, F(\cdot))$  and  $\Omega^{\text{II}}(\cdot, \hat{r})$  (the thick decreasing and increasing curves, respectively).<sup>13</sup> Full employment equilibrium is determined by the intersection at the point  $(n^{\text{FE}}, \omega^{\text{FE}})$  of the two thick curves, when both fundamental postulates of classical economics are satisfied. The volume of voluntary unemployment corresponds to the dis-

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<sup>13</sup>Figure 1 was computed with the following parameter values:  $A\bar{k}^{1-\alpha} = 1$ ,  $\alpha = 0.7$ ,  $\delta = 0.8$ ,  $\gamma = 0.75$ ,  $\hat{r} = 0.075$ . Labour disutility was assumed to be log-normally distributed, with mean 0.1 and variance 1.

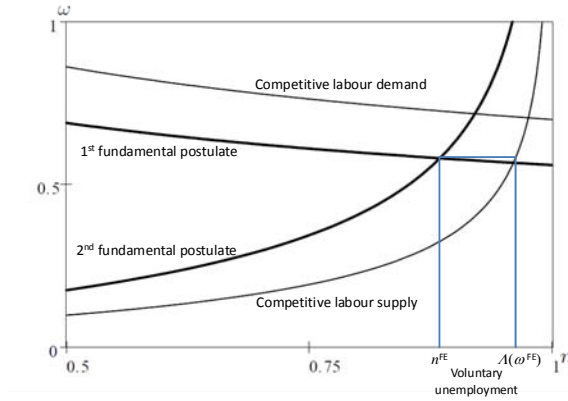


Figure 1: Full employment equilibrium

tance between the two increasing curves at the equilibrium real wage, that is, to  $\Lambda(\omega^{\text{FE}}) - n^{\text{FE}}$ .

Putting aside the somewhat trivial category of frictional unemployment, which does not involve delicate interpretation issues, it should be stressed that the second “postulate is also compatible with ‘voluntary’ unemployment due to the refusal or inability of a unit of labour, 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).<sup>14</sup> The category *voluntary unemployment* covers thus more than the simple

<sup>14</sup>Notice that voluntary unemployment may be due to the refusal of a unit of labour to accept a reward corresponding to its marginal productivity, but only *as a result of* legislation, combination, and so forth. Otherwise, as a result of utility maximization, the refusal will simply lead to chosen *leisure*. This distinction was overlooked by Richard Kahn, when he attributed to Pigou, writing in 1914, the first use of the term ‘involuntary unemployment’, whereas Pigou was in fact referring to involuntary *idleness*, that is, to unemployment proper as opposed to leisure (see Kahn, 1976, p.19).

"combination for collective bargaining", and is in fact still more comprehensive than stated here: this "apparent unemployment" [*sic*] is not only "the effect of a trade union 'closed shop' on the employment of free labour", but also "the result [...] of monopolistic practices on the part of employers" [*sic*], as we read in the second proof of the *General Theory* (Keynes, 1973, XIV, pp.363-364). From the point of view of the individual worker, the term "voluntary" seems of course inappropriate when there is "inability", not "refusal", of a unit of labour to accept the right reward, the one that corresponds to the value of its marginal productivity and that also exceeds its reservation value. But Keynes refers explicitly to the "whole body of labour" and implicitly to all participants in the labour market, including employers and the legislator. As far as the workers are concerned, the so-called voluntary unemployment is, *ex ante*, a deliberate consequence of strategic behaviour, as much so as the deliberate restrained supply by the monopolistic producer, although no one would willingly accept *ex post* to draw an unlucky number when looking for a job.<sup>15</sup> I will not insist on semantics, but it is essential to understand, when coming to political issues, that Keynes' "full" employment does by no means exclude a high and possibly highly variable observed rate of unemployment. Keynes's rate of voluntary unemployment essentially corresponds to Friedman's "natural rate of unemployment", which

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<sup>15</sup>"Thus there is an involuntary element in all unemployment, in the sense that no one chooses bad luck over good; there is also a voluntary element in all unemployment, in the sense that however miserable one's current work options, one can always choose to accept them" (Lucas, 1981, p.242). See also the discussion of Lucas' position in De Vroey (2004, ch.14). This is correct, but Lucas and to some extent De Vroey miss the point, since they focus exclusively on the individual worker's choice when they assess Keynes's distinction between voluntary and involuntary unemployment, thus ignoring the combination and coordination issues that called for the distinction.

supposes imbedded in the general equilibrium equations "the actual structural characteristics of the labor and commodity markets, including market imperfections, [...]" (Friedman, 1968, p.8).

### 3.4 Say's law

As Keynes puts it in the beginning of chapter 3 of the *General Theory*, "the substance of the General Theory of Employment" is that "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" (Keynes, 1936, p.25). So, if we continue to refer to a symmetric economy, short term expectations of effective demand  $Y$  select, quite independently of the second fundamental postulate, one particular point in the graph of the function  $\Omega^I(\cdot, Y)$  which represents the first postulate, namely the point corresponding to  $n = F^{-1}(Y)$ .

The significant question concerns however the adjustments that might be induced by the violation of the second postulate, either the upward adjustment of producers' short term expectations, or the downward adjustment of unions' wage targets. Let me consider the former alternative, and reserve to the next section the discussion of the latter. If producers' short term expectations lead to a situation of less than full employment, will more optimistic expectations be systematically validated? Yes, if we admit that "Supply creates its own Demand", which amounts to accept the supposedly self-fulfilling nature of short term expectations: "The classical theory assumes, in other words, that the ag-

aggregate demand price (or proceeds) always accommodates itself to the aggregate supply price" (Keynes, 1936, p.26), so that  $Y$  is always eventually adjusted to its full employment value  $F(n^{\text{FE}})$ .

How does this adjustment work? If the utility procured by present and future consumption is equal to  $\Gamma C^\gamma \hat{C}^{1-\gamma}$  (with  $0 < \gamma < 1$ ) for both workers and entrepreneurs, real income  $Y$  generates consumption  $C = \gamma Y$  of the composite good and saving  $S = (1 - \gamma) Y$ , which must be equal to investment, assumed to materialise as a purchase of the composite good. How is that investment induced? The young entrepreneur  $j$ , acting as an investor, chooses future capital  $k_j$  so as to maximize, under the technological and sales constraints, the expected real future profit  $\hat{\Pi}_j(k_j)$  of the firm, net of the interest on borrowed capital plus the corresponding principal to be reimbursed  $(1 + \hat{r}) k_j$ . By (2), (3) and the specification of the production function  $\hat{F}(k_j, \hat{n}_j) = A k_j^{1-\alpha} \hat{n}_j^\alpha$  (with a hat to qualify any expected variable, here  $\hat{n}$ ), this expected net real profit is

$$\hat{\Pi}_j(k_j) - (1 + \hat{r}) k_j = (1 - \delta\alpha) \left( \left( \frac{\delta\alpha}{\hat{\omega}_j} \right)^{\delta\alpha} (A k_j^{1-\alpha})^\delta (\hat{\eta}_j \hat{Y})^{1-\delta} \right)^{\frac{1}{1-\delta\alpha}} - (1 + \hat{r}) k_j. \quad (10)$$

I am assuming complete depreciation of capital. The corresponding first order condition for maximization of  $\hat{\Pi}_j(k_j) - (1 + \hat{r}) k_j$  is

$$\underbrace{\delta(1 - \alpha) \left( \left( \frac{\delta\alpha}{\hat{\omega}_j} \right)^{\delta\alpha} (A k_j^{1-\alpha})^\delta (\hat{\eta}_j \hat{Y})^{1-\delta} \right)^{\frac{1}{1-\delta\alpha}} \frac{1}{k_j}}_{\hat{\Pi}'_j(k_j)} - 1 = \hat{r}, \quad (11)$$

which is nothing but the equality of the *marginal efficiency of capital*  $\hat{\Pi}'_j(k_j) - 1$



and the rate of interest  $\hat{r}$ , formulated in chapter 11 of the *General Theory*. This equality can be reformulated so as to express investment directly

$$k_j = \left( \delta A^\delta \left( \frac{1-\alpha}{1+\hat{r}} \right)^{1-\delta\alpha} \left( \frac{\alpha}{\hat{\omega}_j} \right)^{\delta\alpha} \right)^{\frac{1}{1-\delta}} \hat{\eta}_j \hat{Y} \equiv I \left( \hat{r}, \hat{\omega}_j \right) \hat{\eta}_j \hat{Y}, \quad (12)$$

as an increasing linear function of expected future effective demand  $\hat{\eta}_j \hat{Y}$  for good  $j$ , and a decreasing function of both the expected real rate of interest  $\hat{r}$  and the expected future real wage  $\hat{\omega}_j$ .

The preceding analysis of the *propensity to consume* and of the *inducement to invest* is common to Keynes and the Classics. Keynes adopts in particular an essentially classical approach to investment, Fisherian to be precise. The equilibrium analysis of output markets also ends up for Keynes and the Classics with the same equality of saving and investment. In our framework, if we take again the simplifying assumption of full symmetry across firms or industries and if we provisionally ignore transfers from entrepreneurs to rentiers, which would reduce their available income, we obtain the equality:  $(1-\gamma)Y = I(\hat{r}, \hat{\omega})\hat{Y}$ . Keynes separates from the Classics only with regard to the way this equality is brought about. According to Keynes, there is a unique equilibrium value of the effective demand  $Y$ , given long term expectations  $\hat{Y}$ ,  $\hat{w}$  and  $\hat{P}$  (hence  $\hat{\omega} = \hat{w}/\hat{P}$ ), given the money wage  $w$  and given the nominal interest rate  $i$ , as determined by the state of liquidity preference and the quantity of money in wage units.<sup>16</sup> By contrast, in the classical tradition, any feasible level of output

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<sup>16</sup>The real rate of interest  $\hat{r}$  and in fact the nominal rate of interest  $i$  itself depend on the price level  $P$ , which is however perfectly correlated with output  $Y$ , given the money wage  $w$ ,

will be validated by an appropriate adjustment of the rate of interest, which appears as the price equilibrating the primary market for securities, issued by the investors and purchased by the savers: "this tradition has regarded the rate of interest as the factor which brings the demand for investment and the willingness to save into equilibrium with one another" (Keynes, 1936, p.175). Hence, "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. [...] Thus Say's law, that the aggregate demand price of output as a whole is equal to its aggregate supply price for all volumes of output, is equivalent to the proposition that there is no obstacle to full employment" (Keynes, 1936, p.26).

## 4 Generalizing the theory of employment

In Keynes's view of classical theory, Say's law states that *any* pair  $(n, \omega)$  of employment and real wage levels satisfying the first fundamental postulate is sustainable in terms of demand, thanks to appropriate adjustments of the interest rate. More precisely, such adjustments allow demand expectations triggering any feasible level of output to be systematically fulfilled: "the amount of employment is indeterminate except in so far as the marginal disutility of labour sets an upper limit." In this context, it will always be possible for the economy

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through the first fundamental postulate:  $w/P = \Omega^I(F^{-1}(Y), Y)$ .

to experience "an expansion of employment up to the point at which the supply of output as a whole ceases to be elastic" (Keynes, 1936, p.26). In other words, the economy will eventually set at the full employment equilibrium, determined by combining the first and the second fundamental postulates.

By contrast, Keynes wants to show that there is a *unique* pair  $(n, \omega)$  that satisfies both the first fundamental postulate and what he calls the *principle of effective demand* (subsection 4.1), meaning that only in that situation is there enough demand, ultimately induced by producers' expectations, for these expectations to be verified. This makes him move from demand as expected by producers (in chapter 3) to demand as decided by consumers and investors (sketched in chapter 3 and developed in chapters 8 to 12 of the *General Theory*). An underemployment equilibrium is then quite generally obtained. In subsection 4.2, it will however appear that the reasons for the failure of Say's law as regards the appropriateness of interest rate adjustments had yet to be examined, as part of a novel theory of the working of capital markets (developed in chapters 13 to 17 of the *General Theory*). The last important point requiring explanation (provided in subsection 4.3) is of course the inability of wage reductions to restore full employment (a point discussed principally in chapter 19 of the *General Theory*).

#### 4.1 The link between labour and output markets: the principle of effective demand

Opposing to Say's law his principle of effective demand, Keynes rejects the second fundamental postulate, thus admitting the possibility of underemployment equilibria:

"[T]he 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 to employment. The propensity to consume and the rate of new investment determine between them the volume of employment, and the volume of employment is uniquely related to a given level of real wages — not the other way round. If the propensity to consume and the rate of new investment result in a deficient effective demand, the actual level of employment will fall short of the supply of labour potentially available at the existing real wage, and the equilibrium real wage will be *greater* than the marginal disutility of the equilibrium level of employment" (Keynes, 1936, p.30).

Let me express formally these ideas within my suggested model. In my discussion of Say's law, I have considered two categories of consumers: active workers and active entrepreneurs, the latter with the dual role of producers and investors. Both were assumed to devote to consumption a proportion  $\gamma$  of their respective incomes. However, consumers of both classes become old and retire,

and a third category of consumers must be considered: old rentiers, spending in consumption the whole of their wealth, inclusive of their interest income. The output market equilibrium condition must be adjusted accordingly, while keeping the assumption of full symmetry across firms or industries, to simplify the analysis. Young entrepreneurs are born endowed with inherited physical capital  $\bar{k}$ , to which corresponds a financial liability denominated in money units  $\bar{P}\bar{k}$ ,  $\bar{P}$  being the price of the composite good in the previous period.<sup>17</sup> Thus, the retired consumers' real wealth is equal to the real revenue of this financial capital (principal and interest at the given past rate  $\bar{v}$ )  $(1 + \bar{v}) \bar{P}\bar{k}/P \equiv (1 + r) \bar{k}$ , plus their real money holdings, equal to the given quantity of money  $\bar{M}$  deflated by  $P$ . Also, the aggregate real income of active consumers is equal to the sum  $Y$  of real wages and profits, net of the real charges of their debt  $(1 + r) \bar{k}$ . Adding the different components of aggregate demand, namely induced consumption by the young, autonomous consumption by the old, and investment, we obtain in real terms:

$$\begin{aligned}
Y &= \gamma(Y - (1 + r) \bar{k}) + (1 + r) \bar{k} + \bar{M}/P + I(\hat{r}, \hat{\omega}) \hat{Y} \\
&= (1 + r) \bar{k} + \frac{1}{1 - \gamma} \left( \frac{\bar{M}}{P} + I(\hat{r}, \hat{\omega}) \hat{Y} \right), \tag{13}
\end{aligned}$$

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<sup>17</sup>In the simple overlapping generations framework I have adopted, entrepreneurs are active during one period only, becoming retired rentiers in the next. Also, in Keynes's short period approach, investment realised in the present affects production capacity only in the future. Consequently, investment  $\bar{k}$ , decided and effected in the past period by now retired entrepreneurs, is taken over in the present by young entrepreneurs. These entrepreneurs must also bear the charge of the debt  $\bar{P}\bar{k}$ , incurred by their predecessors to finance that investment.

where we find the standard *Keynesian multiplier*  $1/(1 - \gamma)$  applied to the sum of real money holdings and investment.

In nominal terms, using the definitions of the present and future real interest factors  $1 + r \equiv (1 + \bar{i}) \bar{P}/P$  and  $1 + \hat{r} \equiv (1 + i) P/\hat{P}$ , we have:

$$PY = (1 + \bar{i}) \bar{P} \bar{k} + \frac{1}{1 - \gamma} \left( \bar{M} + PI \left( \frac{(1 + i) P}{\hat{P}} - 1, \frac{\hat{w}}{\hat{P}} \right) \hat{Y} \right), \quad (14)$$

where the nominal output  $PY$  appears as a decreasing function of the nominal rate of interest  $i$ , corresponding to the *IS curve* introduced in Hicks (1937, p.153). Notice however that the nominal output is also a decreasing function (by (12)) of the endogenous price index  $P$ ,<sup>18</sup> so that we obtain in fact in the space  $(PY, i)$  a family of *IS curves*, parameterized by  $P$ . We can alternatively use the equality  $Y = F(n)$  and transform equation (14) into a function representing the *principle of effective demand*

$$\begin{aligned} n &= F^{-1} \left( \frac{(1 + \bar{i}) \bar{P} \bar{k}}{P} + \frac{1}{1 - \gamma} \left( \frac{\bar{M}}{P} + I \left( \frac{(1 + i) P}{\hat{P}} - 1, \frac{\hat{w}}{\hat{P}} \right) \hat{Y} \right) \right) \quad (15) \\ &\equiv N^{\text{ED}} \left( \underset{-}{P}, \underset{-}{i}, \underset{-}{\hat{w}}, \underset{+}{\hat{P}}, \underset{+}{\hat{Y}} \right). \end{aligned}$$

Employment is thus decreasing in the price index (by the Pigou effect and the effect through the marginal efficiency of capital), the nominal interest rate and the expected future money wage, and increasing in the expected future price and quantity indices. If we introduce the “temporary assumption that money-wages

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<sup>18</sup>This is because the negative effect of a price increase on the volume of investment through the marginal efficiency of capital dominates the direct positive effect on its value (see (12)).

are constant" (Keynes, 1936, p.29), equal to  $w$ , so that  $P = w/\omega$ , we obtain in the space  $(n, \omega)$  a family of increasing curves parameterized by the money wage  $w$ , the rate of interest  $i$ , and the state of long term expectations  $(\hat{w}, \hat{P}, \hat{Y})$ .

The graph of the function  $\omega \mapsto N^{\text{ED}}(w/\omega, i, \hat{w}, \hat{P}, \hat{Y})$  is represented by the increasing thick curve in Figure 2, where the two other curves correspond to the two fundamental postulates and are taken up from Figure 1.<sup>19</sup> If we follow Keynes's argument, employment is not jointly determined by the two fundamental postulates, but by the principle of effective demand together with the first postulate, as long as the intersection of the corresponding curves lies on the left of the curve representing the second postulate. The difference between the equilibrium level of employment  $n^*$  and its full employment value  $n^{\text{FE}}$  corresponds to what Keynes calls *involuntary unemployment*.

We must however recall that the curve representing the principle of effective demand is just one of a family of curves parameterized by the money wage, the nominal rate of interest (itself dependent upon the money wage, as we shall see), and the state of long term expectations. By letting anyone of the two former variables decrease, we make the representative curve shift to the right, resulting in higher and higher equilibrium levels of employment. Hence, the distinction between the consequences of adopting the principle of effective demand instead

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<sup>19</sup>This is not perfectly exact. The expected real rate of interest  $\hat{r}$  was provisionally taken as fixed in Figure 1, so that the second fundamental postulate corresponded to the set of points  $(n, \omega)$  such that  $\omega = \Omega^{\text{II}}(n, \hat{r})$ . Now, I am taking as fixed the nominal rate of interest  $i$ , so that  $\hat{r}$  is dependent on  $\omega$ : the second fundamental postulate corresponds now to the set of points  $(n, \omega)$  such that  $\omega = \Omega^{\text{II}}(n, (1+i)w/(\omega\hat{P}) - 1)$ . However, by construction, the two expressions of  $\Omega^{\text{II}}$  define curves that have the same intersection with the curve defined by  $\Omega^{\text{I}}$ , at the point  $(n^{\text{FE}}, \omega^{\text{FE}})$ .

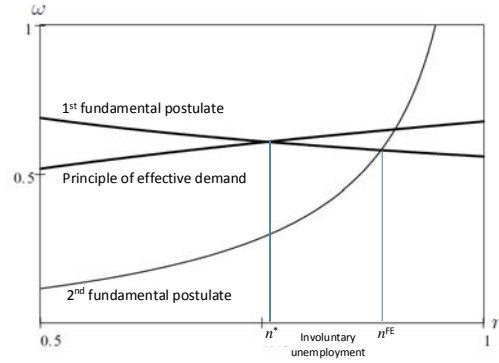


Figure 2: Underemployment equilibrium

of Say's law is yet to be clarified as regards the adjustments of the rate of interest. Also, as a decrease in the money wage seems to be employment improving, we must take into account Hawtrey's objection when referring to "involuntary" unemployment: "if unemployment is to be regarded as 'involuntary', it must be such that a reduction of wages would not remedy it" (letter to Keynes, dated 29.04.1936, in Keynes, 1973, XIV, p.30). I shall address these two points in the two following subsections.

## 4.2 Coordination failures through financial markets

Why does the interest rate fail to respond adequately to an imbalance of saving and investment, leaving that task to the level of employment and thus invalidating Say's law? To answer to this question, we must consider how financial markets coordinate firms' and consumers' decisions.



The first significant point about financial markets is that most of them do not even exist, as illustrated by Keynes's parable of the postponed dinner, at the beginning of chapter 16 of the *General Theory*. As Keynes puts it, "if saving consisted not merely in abstaining from present consumption but in placing simultaneously a specific order for future consumption, [...] the expectation from some future yield from investment would be improved, and the resources released from preparing for present consumption could be turned over to preparing for the future consumption" (Keynes, 1936, pp.210-211). This is however not generally true when markets are incomplete: futures markets, where such specific orders would be made explicit, do actually not exist for many goods and dates (or events), so that future price and output levels  $\hat{P}$  and  $\hat{Y}$  cannot be directly inferred from observed market signals.<sup>20</sup> They can only be *expected* to prevail later in the relevant *spot* markets. As pure long term expectations, they do not play the required role of coordinating signals and, because of their inherent volatility, they may even place investment decisions under the influence of *animal spirits*, as suggested by Keynes in chapter 12. Also, they may be too responsive to currently observed price and demand levels  $P$  and  $Y$ , thus neutralising the necessary adjustments or, worse, making them destabilising. Such is the case of elastic expectations, formally introduced by Hicks (1939,

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<sup>20</sup>Market incompleteness is associated in contemporary general equilibrium theory with long period equilibria (Hicksian equilibria over time): agents are assumed to correctly anticipate future prices and all future (spot) markets are assumed to clear. In such context, the consequence of market incompleteness is essentially to impose restrictions upon wealth transfers among states. I am however referring to the context of short period equilibrium (Hicksian temporary equilibrium), where nothing is assumed about long term expectations fulfilment or about future spot markets clearance. In this context, an important consequence of market incompleteness is the absence of market signals coordinating agents' expectations and plans for the future.

pp.205 and 255) but already contemplated by Keynes in chapter 19 of the *General Theory*, as we shall see in the next subsection. A decrease in the money wage  $w$  and the resulting decrease in the price level  $P$ , instead of triggering a favourable decrease in the expected real interest rate  $\hat{r}$ , as it would under *given* nominal interest rate  $i$  and *given* expected price level  $\hat{P}$ , may then be followed by a reverse effect on  $\hat{r}$ , if  $\hat{P}$  declines more than  $P$ .

Let us however examine how the nominal interest rate itself responds to decreasing prices. A first obstacle in the way of full employment is that, since this rate remunerates holders of assets that are denominated in money, and since the cost of holding money is negligible, the nominal rate of interest is never negative, contrary to the marginal efficiency of capital, which may well be negative at full employment equilibrium. The adjustment of the rate of interest can consequently fall short of full employment because of its zero lower bound. A second, more significant, obstacle lies in the fact that transactions in the financial markets involve not only savers, buying securities in order to transfer part of their current income to the future, and investors, issuing securities in order to finance their investments, but mostly holders of previously issued securities wanting to modify their portfolios. In other words, financial markets are principally secondary markets. As a consequence, the prospective yield of a security may be mainly determined, not by the interest or the dividends it is going to pay, but by its expected future market value at the (uncertain) time of its liquidation.

In order to model this idea, I assume that savings can be held either in

money or in bonds. A bond represents one unit of money available next period and purchased at price  $q \in (0, 1)$ , hence bearing interest at the nominal rate  $i = 1/q - 1$ . When choosing his portfolio, the representative young consumer is assumed to face a liquidity constraint with two components. First, he has to keep his money balance at a proportion not smaller than  $\mu$  of his savings  $PS$ , because of the *transactions* and *precautionary motives* for liquidity preference, introduced in Keynes (1936, p.170). Second, with probability  $\rho$ , he may have to renounce to deferred payments at some time in the future, being then forced to liquidate his bonds before maturity. If on the contrary, with probability  $1 - \rho$ , payments can at that time be surely deferred until the end of next period, he will be able to convert his money balance in interest bearing bonds. Thus, if the expected future price of a bond sold before maturity is  $\hat{q} \in (0, 1)$ , the young consumer secures at the end of the next period, by choosing to hold a cash balance  $m \in [\mu PS, PS]$ , an expected value of his wealth equal to

$$\begin{aligned} & \rho \left( m + \frac{PS - m}{q} \hat{q} \right) + (1 - \rho) \left( \frac{m}{\hat{q}} + \frac{PS - m}{q} \right) \\ = & \left( \rho + \frac{1 - \rho}{\hat{q}} \right) \left( \left( 1 - \frac{\hat{q}}{q} \right) m + \frac{\hat{q}}{q} PS \right). \end{aligned} \quad (16)$$

Clearly, he chooses  $m = \mu PS$  if  $\hat{q} > q$  (if he is a *bull*) and  $m = PS$  if  $\hat{q} < q$  (if he is a *bear*). A *bull* holds money just because of the transactions and precautionary motives for liquidity preference; a *bear* has in addition a *speculative motive* to hold money (Keynes, 1936, p.170).

Suppose now that the expected future price of bonds is distributed in the

consumers' population according to the distribution function  $Q$ :  $Q(q)$  is the proportion of consumers expecting the future price of bonds to be smaller than  $q$  (the proportion of *bears* when the price of bonds is  $q$ ). The aggregate demand  $M$  for money is then

$$M = Q(q) PS + (1 - Q(q)) \mu PS = (\mu + (1 - \mu) Q(q)) (1 - \gamma) (PY - (1 + \bar{i}) \bar{P}\bar{k}), \quad (17)$$

where proportions  $\mu$  and  $(1 - \mu) Q(q)$  of young consumers' aggregate saving  $PS = (1 - \gamma) (PY - (1 + \bar{i}) \bar{P}\bar{k})$  correspond to the transactions/precautionary and speculative components of money demand, respectively (the complementary proportion of saving,  $(1 - \mu) (1 - Q(q))$ , being held in bonds by the *bulls*). Thus, if we take as given the quantity of money  $\bar{M}$ , the equilibrium price of bonds (the one entailing  $M = \bar{M}$ ) is a non-increasing function of the nominal output  $PY$ :

$$q = Q^{-1} \left( \frac{\bar{M}}{(1 - \mu) (1 - \gamma) (PY - (1 + \bar{i}) \bar{P}\bar{k})} - \frac{\mu}{1 - \mu} \right). \quad (18)$$

By equation (18), the nominal rate of interest  $i = 1/q - 1$  is a non-decreasing function  $L(\cdot, \bar{M})$  of the nominal output  $PY$ , the graph of which is nothing but the *LM curve* (*LL* as introduced in Hicks, 1937, p.153).

The *LM curve* is usually presented as nearly horizontal for low levels of the nominal output and the rate of interest, since "there is some minimum below which the rate of interest is unlikely to go" (Hicks, 1937, p.154). Hence, when the economy is severely depressed, the rate of interest is supposed to become

irresponsive to an expansionary monetary policy, giving rise to the so-called *liquidity trap*. This is a reason for Hicks to claim that "the General Theory of Employment is the Economics of Depression" (Hicks, 1937, p.155). This occurrence, plainly defined nowadays as a situation in which the short-term nominal interest rate is zero or close to zero, has been again evoked in the late 1990s in relation to the Japanese slump (Krugman, 1998). It is true that Keynes mentions the possibility "that, after the rate of interest has fallen to a certain level, liquidity-preference may become virtually absolute in the sense that almost everyone prefers cash to holding a debt which yields so low a rate of interest" (Keynes, 1936, p.207). However, he also emphasizes that "the rate of interest is a highly conventional [...] phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be. *Any* level of interest which is accepted with sufficient conviction as *likely* to be durable *will* be durable" (Keynes, 1936, p.203; Keynes's emphasis).

How can we translate this idea in the model we have suggested? The distribution function  $Q$  may be discontinuous at some point  $\hat{q}$  (be it large or small) if the future price of bonds is unanimously expected to be  $\hat{q}$  among a non-negligible subset of market participants, who are *bulls* for  $q < \hat{q}$  and become *bears* as soon as  $q > \hat{q}$ . Correspondingly, the graph of  $Q^{-1}$  in (18) then exhibits a horizontal portion, indicating that the price of bonds (or the rate of interest) ceases locally to respond to variations of either  $PY$  or  $\bar{M}$ . Of course, when the expected future bond prices are very concentrated, although not on a single point, the graph of  $Q^{-1}$  is flat, if not horizontal, over some interval(s). Figure 3 represents,

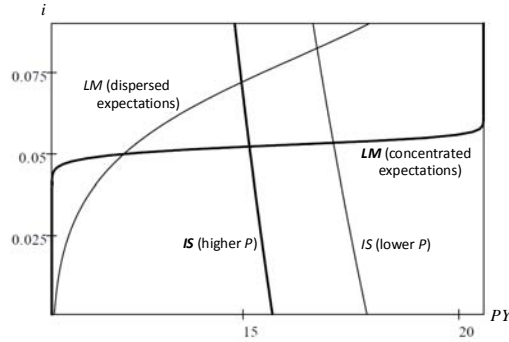


Figure 3: The *IS-LM* diagram

together with two decreasing *IS* curves associated with two different values of  $P$  (the thick curve with the higher  $P$ ), two increasing *LM* curves, computed for the same parameter values, except that the thick curve results from highly concentrated expectations and the thin curve from more dispersed expectations, around the same future interest rate of 5%.<sup>21</sup>

Thus, quite independently of the phase of the business cycle, whether a depression or not, the classical equilibrating adjustment of the rate of interest which is required by Say's law can be blocked or become ineffective under converging expectations of future interest rates. The *special* form of the *LM* curve which Hicks attributes to Keynes, with its flat portion when  $PY$  and  $i$  are both small, corresponds to just one possible situation in which the concen-

<sup>21</sup>The parameter values are those that have been used in Figures 1 and 2 (with, in addition,  $\mu = 0.2$ ). Expectations  $\hat{q}$  of the future price of bonds are assumed to be log-normally distributed, with mean  $1/1.05$  and, for the thick *LM* curve, standard deviation equal to 0.001, for the thin one, equal to 0.015.

tration of expectations becomes indeed likely, since the occurrence of a current interest rate approaching its zero lower bound leaves no place for bulls. The recent macroeconomic analysis since Krugman's revival of the liquidity trap has rightly put more emphasis on the role of expectations of future interest rates than the old Keynesian literature tended to do in this context (see Eggertsson, 2008). However, the issue of their distribution over heterogeneous agents went on being neglected. Even with a positive interest rate, far away from its lower bound, the occurrence of a highly concentrated distribution is not an implausible event. "The energies and skill of the professional investor and speculator are mainly occupied [...] with foreseeing changes in the conventional basis of valuation a short time ahead of the general public" (Keynes, 1936, p.154). As illustrated by the analogy of the *beauty contest*, professional investors devote their "intelligences to anticipating what average opinion expects the average opinion to be" (Keynes, 1936, p.156). The coordination of expectations among market operators becomes largely the aim of the game, independently of any reference to fundamentals, a kind of coordination that, by its very effectiveness, partly accounts for the possibility of a systemic coordination failure originating in the financial markets.

The model is now complete. Using, under symmetry across firms, the first fundamental postulate (2) and the principle of effective demand (15), together with the *LM* equation  $i = L(PY, \bar{M})$  and the equalities  $P = w/\omega$  and  $Y =$

$F(n)$ , we obtain:

$$\omega = \Omega^I(n, F(n)) \quad (19)$$

$$n = N^{\text{ED}}\left(w/\omega, L((w/\omega)F(n), \bar{M}), \hat{w}, \hat{P}, \hat{Y}\right), \quad (20)$$

a system of two equations determining the equilibrium values  $(n^*, \omega^*)$  of the employment and the real wage, given the money wage  $w$ , the money supply  $\bar{M}$  and the state of long term expectations  $(\hat{w}, \hat{P}, \hat{Y})$  relative to the labour and output markets,<sup>22</sup> plus the distribution  $Q$  of expectations concerning the financial market (which are implicit in  $L$ ).<sup>23</sup> Under involuntary unemployment ( $n^* < n^{\text{FE}}$ , with  $n^{\text{FE}}$  determined by the first and second fundamental postulates<sup>24</sup>), we may expect a downward adjustment of the money wage  $w$ , heretofore provisionally taken as fixed (as in the *General Theory*, until chapter 19). Such an adjustment would in principle increase  $n^*$  and lower  $n^{\text{FE}}$  (so diminishing involuntary unemployment), in particular through a decline in the money rate of interest. This decline, as just shown, can however be blocked by convergent expectations of

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<sup>22</sup>By varying the state of long term expectations, we obtain a continuum of possible equilibria. This is a first step allowing to identify in the *General Theory* the possibility of "a continuum of steady-state unemployment rates" (Farmer, 2012, p.3). The second step in the way of a continuum of *steady state* equilibria is however missing: nothing is said about *self-fulfilment* of the long term expectations.

<sup>23</sup>"Thus we can sometimes regard our ultimate independent variables as consisting of (1) the three fundamental psychological factors, namely, the psychological propensity to consume [ $\gamma$ , implicit in  $N^{\text{ED}}$ ], the psychological attitude to liquidity [ $L$ ] and the psychological expectation of future yield from capital-assets [resulting from  $(\hat{w}, \hat{P}, \hat{Y})$ ], (2) the wage-unit [ $w$ ] as determined by the bargains reached between employers and employed, and (3) the quantity of money [ $\bar{M}$ ] as determined by the action of the central bank; so that, if we take as given the factors specified above, these variables determine the national income (or dividend) [ $Y = F(n)$ ] and the quantity of employment [ $n$ ]" (Keynes, 1936, pp.246-247).

<sup>24</sup>Since the function  $\Omega^{\text{II}}$ , representing the second fundamental postulate, has the real rate of interest  $\hat{r}$  as its second argument, we must again resort to the *LM* equation plus the equalities  $P = w/\omega$  and  $Y = F(n)$  to determine  $n^{\text{FE}}$ .



the price of bonds. As to the decline in the real rate of interest due to a decrease in the price level  $P$ , we have seen that, under elastic expectations, it may be neutralised or even reversed by a corresponding decrease in the expected price level  $\hat{P}$ .<sup>25</sup>

We have finally to consider the real balance effect of a generalized price decline, supposed to increase consumption and investment. Keynes considered the possibly favourable effect of an increase in the quantity of money expressed in wage units, through a declining money interest rate (the so-called *Keynes effect*, working through  $L$ ), but ignored the resulting direct increase in consumers' wealth (the *Pigou effect*). The Pigou effect is however not the end of the story: "the method of increasing the quantity of money in terms of wage-units by decreasing the wage-unit increases proportionately the burden of debt" (Keynes, 1936, p.268), with a "depressing influence on entrepreneurs", since "the embarrassment of those entrepreneurs who are heavily indebted may soon reach the point of insolvency [if the fall of wages and prices goes far]" (Keynes, 1936, p.264). The point of insolvency is indeed reached as soon as the entrepreneurs' real income  $F(n) - \omega n$  becomes smaller than the real charges of their debt  $(1 + i) \bar{P}k/P$ , so that the overall wealth effect of wage deflation cannot be assessed on the sole basis of an increase in  $\bar{M}/P$ .

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<sup>25</sup>The adverse effect of elastic expectations of the future price level  $\hat{P}$  will be mitigated if the expectations of the future money wage  $\hat{w}$  are themselves elastic.

### 4.3 Coordination failures originating in the labour market

Financial markets are not alone responsible for the emergence of coordination problems resulting in the failure of Say's law and the consequent possibility of underemployment equilibria. In Keynes's analysis of chapters 2 and 19 of the *General Theory*, the working of the labour market, making it impossible to promptly achieve the appropriate money wage adjustments, is also a source of such problems. At this point, it might seem that we are after all reaching the neoclassical indictment that Keynes's theory ultimately differs from classical theory by the sole assumption of money wage rigidity. The usual meaning given to this assumption, making it result from labour market imperfections, is however inadequate. Just as the "rigidity" of the money rate of interest which may neutralise its coordinating role is due, not to any financial market imperfection, but to the concentration of expectations on a too high future interest rate, money wage "rigidity" may naturally result from decentralised bargaining in an otherwise perfect market.

Let us consider the reasons for this money wage rigidity. It has been assumed in section 3 that wage bargains take place at firm/industry level. However, the labour market is not supposed to be segmented: workers can circulate, although imperfectly, from one micro-market to another, so that violations of money wage uniformity can only be transitory. This implies that in a transparent and fluid labour market the solution to the bargaining problem analysed in subsection 3.2 would in fact be constrained to satisfy  $w_j = \max_{j'} \{w_{j'}\} \equiv w$ .<sup>26</sup> Setting

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<sup>26</sup>This constraint is seen to be consistent with the modelling of the output market, once it is

$w_j < w$  would represent for union  $j$  as well as for firm  $j$  the threat of making the workers move to other micro labour markets.<sup>27</sup> This simple fact is the clue to the downward rigidity of the money wage, coupled with the perfect flexibility of the real wage: as “the effect of combination on the part of a group of workers is to protect their relative real wage”, “every trade union will put up some resistance to a cut in money-wages, however small,” whereas “no trade union would dream of striking on every occasion of a rise in the cost of living” (Keynes, 1936, pp.14-15).

This characteristic of wage behaviour is the direct consequence of decentralised bargaining in a perfect market for homogeneous labour, and does not have to be explained, as usually done, in terms of money illusion, observance of relative wage norms, preference externalities, or whatever. As Keynes observes, "except in a socialised community where wage policy is settled by decree, there is no means of securing uniform wage reductions for every class of labour" (Keynes, 1936, p.267). This has as a natural consequence the possibility of a coordination failure: employers and unions can be stuck in corner solutions to their bargaining problems, without being able to independently decrease real wages to their target values. Such a coordination failure in the labour market may thus be made responsible for the violation of the second fundamental postulate, that is, for the existence of equilibria with less than full employment. We may be

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recalled that we assume differentiated output but homogeneous labour. Indeed, if we remove product differentiation, accounting for some monopoly power in the output market, that is, if we take  $\delta = 1$ , the violation of the constraint  $p_j = \min_{j'} \{p_{j'}\} \equiv P$  implies *zero demand* for the output of firm  $j$ .

<sup>27</sup>One might object that unemployed workers would want to apply for a job in firm  $j$ , even if  $w_j < w$ . Costs of turnover incurred by firm  $j$  may however more than compensate the gain obtained through the reduction of  $w_j$ .

tempted to speak in this case of “involuntary” unemployment. Think however of Hawtrey’s objection as quoted above: “if unemployment is to be regarded as ‘involuntary’, it must be such that a reduction of wages would not remedy it.”

Hawtrey’s objection had in fact already been anticipated by Keynes, when he wrote: “there may exist no expedient by which labour as a whole can reduce its *real* wage to a given figure by making revised *money* bargains with the entrepreneurs” (Keynes, 1936, p.13). The question here is not that of finding the real wage corresponding to full employment, but that of implementing that real wage through an appropriate stimulation of the effective demand. As Keynes writes,

"When we enter on a period of weakening effective demand, a sudden large reduction of money-wages to a level so low that no one believes in its indefinite continuance would be the event most favourable to a strengthening of effective demand. But this could only be accomplished by administrative decree and is scarcely practical politics under a system of free wage-bargaining. On the other hand, it would be much better that wages should be rigidly fixed and deemed incapable of material changes, than that depressions should be accompanied by a gradual downward tendency of money-wages, a further moderate wage reduction being expected to signalise each increase of, say, 1 per cent. in the amount of unemployment. For example, the effect of an expectation that wages are going to sag by, say, 2 per cent. in the coming year will be roughly equivalent to the

effect of a rise of 2 per cent. in the amount of interest payable for the same period" (Keynes, 1936, p.265).

When employers and unions all agree that the real wage is too high, tentative money wage reductions in some sector, made possible by the "imperfect mobility of labour" (Keynes, 1936, p.14), may be the signal triggering the required adjustment in the whole economy. Because of insufficient coordination across micro labour markets, this adjustment tends however to be slow and lasting, creating a deflationary bias in the expectations of the future price level, hence increasing the real rate of interest and depressing effective demand.

Since Keynes's objective is to generalize the theory of employment, we should finally not forget that "the same observations apply *mutatis mutandis* to the case of a boom" (Keynes, 1936, p.265). However, if money wage reductions can be blocked, or slowed down, by decentralised bargaining, the same argument does not apply in the opposite sense. A money wage increase may originate in a single industry  $j$  where full employment prevails, as a consequence of an increase in the effective demand for its output  $\eta_j Y$ , resulting itself either from an idiosyncratic positive shock on  $\eta_j$  or of an aggregate shock on  $Y$  generated for instance by an expansionary monetary or fiscal policy. If the labour market is sufficiently integrated, the constraint  $w_{j'} \geq w_j$  impending on any other industry  $j'$  will then determine the propagation of the wage increase to the whole economy, even in general conditions of less than full employment.<sup>28</sup> *A fortiori*, government

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<sup>28</sup> "That the wage-unit may tend to rise before full employment has been reached, requires little comment or explanation. Since each group of workers will gain, *cet. par.*, by a rise in its own wages, there is naturally for all groups a pressure in this direction, which entrepreneurs

efforts to reduce *voluntary* unemployment, however high, by an expansionary macroeconomic policy will necessarily have inflationary consequences without a significant improvement of the employment situation. This illustrates the importance, from the viewpoint of economic policy, of Keynes's distinction between voluntary and involuntary unemployment.<sup>29</sup> It further shows that, contrary to a persistent belief, Keynes's analysis can be easily applied to what has been called stagflation in the mid-1960s.

## 5 Concluding remarks

In order to reconsider the relation between Keynes and the Classics, in particular by assessing the relative generality of their respective theories, I suggested a *new Keynesian* model of the *General Theory*. As with Hicks's *IS-LM* model, we may reduce it to a simple diagram. However, instead of focusing on the financial market, with the nominal income and the money rate of interest involved, my diagram focuses on the labour market and involves employment and the real wage. Three curves represent significant relationships between these two variables, corresponding to what Keynes calls the two fundamental postulates of classical economics and the principle of effective demand. This representation enlightens the comprehension of book I of the *General Theory*, and in

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will be more ready to meet when they are doing better business. For this reason a proportion of any increase in effective demand is likely to be absorbed in satisfying the upward tendency of the wage-unit" (Keynes, 1936, p.301). Downward nominal wage rigidity and stochastic shocks in the demand for the output of individual firms are the main features embedded in the macroeconomic model of Akerlof, Dickens and Perry (1996), which is similar, as regards the output and labour markets, to the model presented in this paper.

<sup>29</sup>Rivot (2011) studies the relationship between this distinction and Keynes's economic policy positions as sustained in his political writings.

particular of the supposedly obscure chapter 2, which is completely neglected in the *IS-LM* representation. Above all, it illustrates the generalization of classical theory, according to which the three curves always intersect at the same point, and allows for a clear-cut distinction between voluntary and involuntary unemployment.

The *IS* and *LM* relationships are also implicit in the suggested model, as determinants of the principle of effective demand. In my interpretation, they are however very much dependent upon the state of expectations, a point which has been largely recognized with respect to the *position* of the curves, supposed to shift in response to shocks in expectations. A crucial point in Keynes's argument, since it concerns one of the main sources of failure of Say's law, namely the irresponsiveness of the money interest rate, is however that the *distribution* of expectations of future interest rates *shapes* the *LM* curve, making it flatter and flatter as dispersion decreases to zero. We thus have another rationale for the *liquidity trap*, which appears as the result of unanimous expectations, not necessarily close to the (zero) lower bound of possible interest rates.

A last concluding remark should be added. Keynes's underemployment equilibria do not result as often pretended from wage rigidity, even if they suppose an imperfect downward flexibility of money wages. This is explicitly related to the impossibility for firms and unions to simultaneously *coordinate* at the economy level on the real wage required for full employment equilibrium. As a consequence, money wage bargains at the firm or industry level, must take into account the protection of *relative* wages. Keynes's relative wage hypothesis is

not the result of irrational behaviour or of non standard workers' preferences. It may be easily rationalized by a competitiveness constraint: unions and firms occupy opposite positions in the bargaining process going on in each micro-market, but they compete for labour, side by side, against the rest of the labour market.

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### **Abstract**

The paper suggests a *new Keynesian* model of the *General Theory*. A reduced form entails a diagram with three curves relating employment and the real wage, which represent the two fundamental classical postulates and the principle of effective demand. This diagram illustrates better than *IS-LM* the generality of Keynes's theory, clarifying the distinction of voluntary and involuntary unemployment. Other significant features are the role of the distribution of expected interest rates among heterogeneous agents, whether dispersed or concentrated, in shaping the *LM* curve, as well as the role of wage competitiveness constraints as a foundation of Keynes's relative wage hypothesis.

### **Keywords**

Keynes's model, involuntary unemployment, coordination failures, liquidity trap, relative wages.