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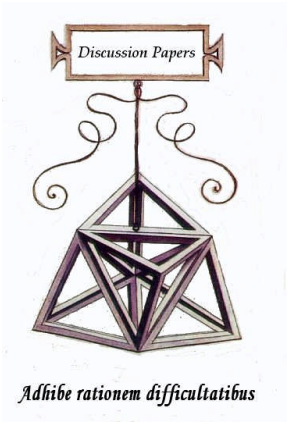

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From Wage Rigidities to Labour Market Rigidities: A Turning-Point in Explaining Equilibrium Unemployment?

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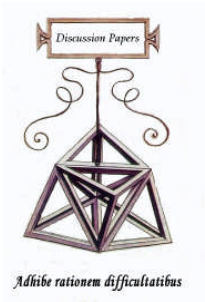

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Abstract
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This paper offers a critical discussion of the concept of labour market rigidity relevant to explaining unemployment. Starting from Keynes's own view, we discuss how the concept of labour market flexibility has changed over time, involving nominal or real wage flexibility, contract flexibility or labour market institution flexibility. We also provide a critical assessment of the factors that lead the search framework highlighting labour market rigidities (frictions) to challenge the more widespread explanation of equilibrium unemployment grounded on wage rigidity.

Classificazione JEL: E12, E24
Keywords: Labour Market Rigidities, Nominal and Real Wages, Unemployment, Search Theory

"*Labor-market flexibility is a much discussed but still vague concept*"

Christopher A. Pissarides (1997, p. 516)

"*It seems clear that those who point to labour-market rigidity as the source of high unemployment have something other than simple nominal or real wage rigidity in mind*"

Robert M. Solow (1998, p. 190)

1. Introduction

The macroeconomic role of the labour market has always been at the very centre of discussions about unemployment. Moreover, in such discussions, the concept of *labour market flexibility* or *rigidity* has often played a prominent role: according to a dominant perspective (too often accepted uncritically), stronger rigidities are associated with higher unemployment and vice versa. However, as argued by Pissarides (1997, p. 516) and Solow (1998, p. 190), in some theoretical frameworks "labour market rigidity/flexibility" is not defined very precisely or directly and, more relevantly, in the economic literature this concept has changed, sometime even remarkably, over time.

The aim of this paper is twofold. Firstly, starting from Keynes's own view, we discuss how the concept of labour market flexibility, particularly in relation to equilibrium unemployment, has changed over time involving the flexibility of (nominal or real) wage, contracts or labour market institutions. We then provide a critical assessment of the factors that lead labour market rigidities (frictions) stressed by the search framework (e.g. Pissarides 1985; 2000; Mortensen and Pissarides 1994) to challenge the more widespread explanation of equilibrium unemployment grounded on wage rigidity.

In the traditional neoclassical explanation of unemployment, the real wage rate plays the most important role: (involuntary) unemployment occurs due to a real wage rate which is too high compared to its market-clearing level. Thus, in such a theoretical context, the concept of labour market rigidity refers to real wage rates: the labour market is (significantly) rigid if there are forces that prevent the reduction of a real wage rate fixed higher than its market clearing level. However, in the neoclassical world, the conventional way to achieve a flexible real wage rate is through a flexible nominal wage rate; hence nominal wage flexibility is at least as important as real wage flexibility.[1] Moreover, in perfectly competitive labour markets, nominal wage flexibility should be ensured by the free operation of market adjustments, making full employment the normal state of affairs.

The literature since Keynes's *General Theory* has rejected the insights of the neoclassical model or abounded some of its hypotheses, exploring several issues in depth. For instance, agreed that it is not so useful to refer to (market clearing) models in which labour market flexibility is defined with reference to *perfectly* and *instantaneously* flexible nominal wages, which concept of labour market flexibility must we consider? In other words, what are the rigidities that actually affect labour market performance and contribute to explain the persistence of involuntary unemployment over time? Furthermore, in the absence of perfect and instantaneous flexibility, do greater flexibility of wages and other institutional variables in labour markets strengthen the equilibrating mechanisms, or do they weaken them? More generally, is labour market flexibility a good thing for society as a whole?

In this paper, we argue that, in explaining unemployment behaviour and its persistence over time, all theories we survey, with the prominent exception of Keynes's own work, hinge, more or less directly, on the presence of some sources of (real) wage rigidity. In particular, we stress that while this is a well-known argument in relation to some theoretical models (e.g. New Keynesian models of the labour market), it substantially holds true also for other

[1] A good example of this argument is given by the contributions by Hahn and Solow (1986; 1995) in which the effects of nominal wage flexibility are examined in an OLG model with flexible real wage rates.

approaches to equilibrium unemployment, most notably the search or matching framework, according to which unemployment is usually explained as a result of “labour market rigidities” or “frictions”, instead of wage rigidity. In our opinion, the key role actually played by wage rigidity largely reflects the common neoclassical framework underlying all those models (even those labelled as “Keynesian”).

The remaining part of the paper is organized as follows. Section 2 briefly summarizes Keynes’s arguments on wage behaviour and unemployment. It also reaffirms that, though a common presentation of his work (even provided by theories that commonly belong to the Keynesian tradition) tends to emphasize the role of nominal wage rigidity, in Keynes’s own idea there is no concept of labour market rigidity that actually plays a major role for the unemployment equilibrium result. Section 3 introduces New Keynesian theories of real wage rigidity, which have also served as an institutional background for the so-called “wage-gap hypothesis” for high unemployment in Europe during the 1980s and 90s. Furthermore, it is also discussed how, in such a theoretical framework, some scholars have advanced the idea that contract rigidity, far more than wage rigidities, represents the relevant concept for explaining equilibrium unemployment (and adverse business fluctuations). Section 4 describes the theoretical switching from contract (or real wage) rigidities to the broad category of labour market rigidities (or frictions). Section 5 briefly reviews the search or matching model of unemployment and Section 6 disentangles the perhaps surprising role of real wage rigidity inside that framework. Finally, section 7 concludes.

2. Nominal Wage Rigidity and Unemployment in Keynes and (Old) Keynesian View

According to a widespread view of Keynes's original work, what is crucial in Keynesian economics in explaining unemployment is *nominal wage rigidity* (e.g. Mankiw 1993, pp. 3-4). This misleading interpretation may be accounted for as follows: i) at the beginning of *The General Theory* (*GT*, Chapter 2), Keynes assumed that the nominal wage rate was constant in order to facilitate the exposition of his argument (however, he also clarified that "the essential character of the argument is precisely the same whether or not money-wages [...] are liable to change" (*GT*, p. 27)); and ii) he also provided a well-known reason for the observation of downward nominal wage stickiness in the presence of excess labour supply, in the circumstances of British industrial relations between the two World Wars, which related to workers' concern about relative wages. In fact, in Chapter 19 of *The General Theory*, Keynes also considered in great detail the effects of a nominal wage reduction (or flexibility) and he pointed out that "the precise question at issue is whether the reduction in money-wages will or will not be accompanied by the same aggregate effective demand as before" (*GT*, p. 259). In particular, he argued that, in a small closed economy, the way in which nominal wage cuts would produce positive effects on unemployment (via increasing aggregate effective demand) could operate primarily through their impact on the interest rate (the "Keynes effect"). In other words, holding a nominal quantity of money constant, a decline in prices that follows that of nominal wages will produce an increase in the real quantity of money and hence a decrease in the interest rate that could stimulate aggregate demand via investment expenditure. Keynes, however, argued that, starting from an insufficient aggregate demand and underemployment equilibrium, a policy of greater nominal wage flexibility would be unlikely to generate forces powerful enough to lead the economy towards full employment. On the contrary, the main result of this policy would be to cause a great instability of prices "so violent perhaps as to make business calculations futile in an economic society functioning after the manner of that

in which we live" (*GT*, p. 269). In sum, in Keynes's own view, it was highly likely that the negative effects (on aggregate demand) of nominal wage flexibility would have outweighed the positive effects. As a consequence, aggregate demand, output and employment would be decreased rather than increased. Furthermore, fluctuations of prices and instability of short-run employment equilibrium would be reduced with a rigid (nominal) wage policy (*GT*, p. 271).[2]

Although Keynes provided several arguments for the importance of negative effects produced on aggregate demand by nominal wage cuts, during the 1960s the dominant interpretation of his theory put forward by the "neoclassical synthesis" mainly focused instead on the limits of the mechanism through which the positive (Keynes) effect operates in the liquidity trap case (perfectly horizontal LM curve) and in the interest-inelastic investment case (perfectly vertical IS curve).[3] At the same time, Keynesian economists of the neoclassical synthesis also emphasized that Keynes did not duly consider another more direct effect that falling nominal wages (and prices) would produce, namely the real-balance or Pigou effect (e.g. Pigou 1947; Patinkin 1948) which, by increasing real wealth in the form of increased real value of base money, may in turn increase aggregate demand via a rise in consumption expenditure and, possibly, also in investment expenditure as wealth-owners seek to maintain portfolio balance between real and nominal assets. This led the above economists to conclude that (downward) nominal wage rigidity was crucial in preventing neoclassical automatic adjustment to full employment and in explaining the persistence of Keynesian unemployment.[4]

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[2] On this point, see also Keynes (1973, pp. 343-67; 1981, pp. 3-16). In Meccheri (2007) a more general discussion is provided.

[3] Although Keynes first introduced these two theoretical reasons why the Keynes effect might fail, he also disclaimed belief in their practical significance. This particularly holds for the liquidity trap case, about which Keynes said, "whilst this limiting case might become practically important in future, I know of no example of it hitherto" (*GT*, p. 207).

[4] For instance, in his 1944 ground-breaking article, Modigliani clearly states "It is usually considered as one of the most important achievements of the Keynesian theory that it explains the consistency of economic equilibrium with the presence of involuntary unemployment. It is, however, not sufficiently recognized that, except in a limiting [liquidity trap] case, this result is due *entirely* to the assumption of "rigid

In the neoclassical synthesis, however, "crucial" (nominal) wage rigidities were assumed rather than explained. Thus one of the most important contributions of New Keynesian Economics (NKE), which starts to emerge during the late 1970s, has often been associated with the improvements obtained in providing consistent micro-foundations for the phenomena of sluggish wage (and price) adjustments in order to reconcile Keynes's theory with the (neo)classical tradition.[5] For instance, two prominent New Keynesian economists state this explicitly by arguing, "The New Keynesian Economics [...] succeeds both in filling the lacunae in traditional Keynesian theory (e.g. by explaining partial wage rigidities, rather than simply assuming rigid wages) and resolving the paradoxes and inconsistencies of more traditional Keynesian theory" (Greenwald and Stiglitz 1987, p. 126). However, at least three major aspects distinguish NKE from Keynes's original ideas about the nexus between wage flexibility and unemployment: i) differently from Keynes, new Keynesian theories of involuntary unemployment mainly concentrate on *real wage rigidity*; ii) although both in analyses by Keynes and the new Keynesians a decrease in the real wage rate is necessarily linked to an increase in employment, the mechanism which underlies this relation differs markedly in the two frameworks; iii) new Keynesian models of the labour market largely leave unclear the role of aggregate demand and expectations (i.e. animal spirits) in affecting unemployment.

Before turning to real wage rigidity and analyzing in greater detail the three points above in relation to NKE, it is important to emphasize that, in the economics of Keynes, real wage rigidity does not play any major role.

[money] wages" (Modigliani 1944, p. 65, italics added). Instead, for some contributions during the late 1970s and early 1980s closer to Keynes's view that wage (and price) rigidity is not the only problem and perhaps not even the main problem, see Tobin (1975), Hahn (1984), Schultze (1985), Hahn and Solow (1986, 1995) and De Long and Summers (1986).

[5] Some authors (e.g. Zenezini 1997, p. 259) argue that this is due to the fact that Keynesian economists did not attribute any importance to nominal wage rigidity in explaining unemployment. We believe that this is undoubtedly true with reference to Keynes's own view. At the same time, we are sceptical that this argument can also be extended to the Keynesian economists of neoclassical synthesis. Indeed, Keynesian unemployment would not have been relegated to a "special case" if the argument also held for the neoclassical synthesis.

Labelling as "fallacy of composition" the dominant (neoclassical) view according to which a nominal wage reduction also automatically leads to a decline in the real wage rate, Keynes emphasized that the latter is not directly fixed by economic agents through bargaining (e.g. Trevithick 1992) and that only a rise in the effective demand would determine, via an increase in prices, a fall in the real wage rate (together with an increase in output and employment). Literally, "[t]he 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" (*GT*, p. 30). Moreover, Keynes believed that real wages would be a by-product of the remedies to restore equilibrium, since they "come in at the end of the argument rather than at the beginning" (Keynes 1973, p. 178). Putting it another way, in Keynes's view, the real wage rate is rigid only if the level of effective demand is fixed. Hence real wage rigidity does not represent either a prominent aspect in the functioning of the labour market or, still less, a crucial point in explaining unemployment. [6]

To sum up, if we are looking for a concept of labour market rigidity in Keynes's *General Theory*, it refers to nominal wages. Nevertheless, although various (old and new) Keynesian economists have emphasized such rigidities as being somehow responsible for Keynes's most important results, in his own view nominal wage rigidity was not the main source of unemployment and, as a consequence, nominal wage cuts were not the proper cure for it (and they might not be a cure at all).

[6] The recent micro-foundation of *The General Theory* proposed by Farmer (forthcoming) goes exactly in the same direction.

3. Real Wage and Contract Rigidity in New Keynesian Models of the Labour Market

Although New Keynesian theories include both nominal and real wage (and price) rigidities, those that deal more directly with involuntary unemployment as an equilibrium phenomenon refer to real rigidities (e.g. Snowdon, Vane and Wynarczyk 1994, Chapter 7).[7] First of all, it is important to stress that New Keynesian theories of real wage rigidity in labour markets tackle a somewhat different question than the traditional Keynes (macroeconomic) issue concerning insufficient aggregate demand: they explain why, regardless of the level of aggregate demand, labour markets do not clear at the *microeconomic* level when there is persistent involuntary unemployment. In such a perspective, NKE provide different possible explanations which include, most prominently, implicit contracts, efficiency wage theories and insider-outsider models.

The first new Keynesian attempt to provide microeconomic rationales for real wage rigidity concerns the implicit contract theory (e.g. Azariadis 1975; Baily 1974; Gordon 1974). Within this theory, firms are assumed to be in a better position to absorb risk than workers. Technically speaking, the latter are risk-averse and they would like to be provided with insurance against fluctuations in income and consumption. As a consequence, if financial markets cannot be used to provide insurance, then efficient (implicit) labour contracts can be designed so that firms provide it in the form of stable (or rigid) wages. Although contracts to insure employees' earnings have some

[7] Indeed, the earliest NKE attempts to provide consistent microeconomic foundations to Keynesian outcomes referred to nominal wage rigidity. In particular, the long-term and staggered wage contract models, initially proposed by Fischer (1977), Phelps and Taylor (1977) and Taylor (1980), pointed out that the presence of explicit (or implicit) labour contracts predetermining the nominal wage for an agreed period can generate sufficient nominal wage inertia. However, a criticism levelled at this literature is that the time between renegotiations is exogenously determined. Thus critics have pointed out that the existence of such contracts and their expiry dates are not explained by sound microeconomic principles. Moreover, and more importantly for our discussion, the main goal of such models was to explain macroeconomic fluctuations and non-neutrality of money, while they dealt only incidentally with the presence of involuntary unemployment and its persistence over time as an equilibrium outcome.

characteristics that are promising for understanding empirical evidence on wage behaviour (e.g. Malcomson 1999), they are not enough to explain involuntary or Keynesian unemployment. For instance, Gottfries (1990) pointed out that the theory of implicit contract is at the very best able to explain why firms do not cut wages and lay off their employees in recessions, but it cannot explain why firms do not hire new workers at lower wages.[8] Changes in unemployment are related to differences between layoff and hiring. Hence a theory of unemployment must be able to explain why, during recessions, hiring rates fluctuate so as to exacerbate unemployment rates, rather than working to clear the labour market. In this regard, efficiency wages and insider-outsider theories provide some more convincing answers. In a theoretical framework with asymmetric information, efficiency wage models (e.g. Akerlof and Yellen 1986; Weiss 1990) describe several reasons why cutting wages adversely affects the quality or productivity of labour and increases, in the end, its cost measured in terms of efficiency units. The most important versions of this story focus on the effect on the quality distribution of workers hired (the adverse selection effect) and the effect on the performance of individual workers (the incentive or moral hazard effect). Finally, in insider-outsider theories (e.g. Solow 1985; Lindbeck and Snower 1990), insiders (incumbent workers) have some power in determining, at least partially, firm's wage and employment decisions due to the presence of labour turnover costs and the possibility of affecting the motivations of newly hired workers. Since it is costly for a firm to exchange insiders for outsiders (unemployed workers), insiders can extract a share of the economic rent generated by such factors. Moreover, since in these models real wages are (downwardly) rigid, economic shocks may have little or no effect on the real wage rate, but simply lead to variations in (un)employment.

Although New Keynesian economists refer to their theories as those offering a compelling set of explanations to "the center-pieces of Keynesian explanations of unemployment", namely "the failure of wages to adjust with

[8] Now it is widely recognized that implicit contract theory is not even able to provide a completely convincing explanation of layoffs either (e.g. Arnott, Hosios and Stiglitz 1988).

sufficient speed to clear labour markets" (Stiglitz 1992, p. 296; Greenwald and Stiglitz 1987, p. 121; see also, in the same vein, Ball, Mankiw and Romer 1988, p. 2), as already noted, there are substantial differences between Keynes's own theory and the New Keynesian models outlined above. While Keynes did not concentrate on *real wage rigidity*, such rigidity is the main focus of new Keynesian models that aim to explain the persistence of involuntary unemployment over time. Contracts to provide insurance (stabilize workers' consumption), motivate employees or attract high quality applicants are necessarily concerned with real earnings (wages). Similarly, earnings rents for insiders with respect to outsiders clearly refer to real wages. By contrast, they have little to say about nominal wage rigidities, since they are perfectly consistent with flexible nominal wages (and prices), and appending a monetary sector to such models, without any further complications, would leave the real (non-Walrasian) equilibrium unchanged.[9] Moreover, in these models, real wage rigidity is due to optimal (equilibrium) choices of rational firms and workers. Thus policies to reduce the real wage rate must address changes in microeconomic incentives for them (e.g. modifying social institutions in the labour markets, increasing labour productivity, reducing insiders' power, etc.), while, in this direction, the role (if any) of aggregate demand is left in the background or not considered at all. As a consequence, unemployment in such models, due to a real wage rate which is too high compared to its market-clearing value (without any clear reason for this, which can be connected to effective demand deficiency), is more similar to the classical than Keynesian concept of unemployment.

Given the main focus of this paper, i.e., presenting an overview of the changes which the concept of labour market rigidity has theoretically experienced over time, it is also interesting to note that some new Keynesian scholars, most notably Stiglitz (1992), have emphasized that *contract rigidities*, far more than wage rigidities, is the main concept for the explanation of

[9] Indeed some contributions in the efficiency wage literature are compatible with both real and nominal wage rigidity. We refer to turnover and sociological models (e.g. Stiglitz 1985; Akerlof 1982), in which relative (instead of absolute) wages are the key factor for reducing labour costs.

equilibrium unemployment (and macroeconomic fluctuations). While contracts are not very interesting in a frictionless Walrasian setting with a complete set of markets and perfect information, they play a crucial role in models in which markets are incomplete and information is imperfect. As a consequence, in this context, moral hazard, adverse selection and hold-up issues (e.g. Williamson 1985) prove important, and providing risk-averse agents with insurance becomes non-trivial. However, for the same reasons, namely transaction costs and bounded rationality, for which markets are imperfect, contracts are also incomplete and costly to enforce. These limitations of contracts can produce major consequences: in the absence of external enforcement (due to contractual incompleteness), contracts, to be effectively carried out, must be *self-enforcing* and this requires (the persistence of) rents. For instance, whenever monitoring workers' effort is costly and effort-contingent labour contracts are unenforceable because effort is not verifiable by a court, rents will be required to motivate workers. Involuntary unemployment is a possible way to provide them, as it is in the standard shirking version of the efficiency wage theory due to Shapiro and Stiglitz (1984). This is because the present discounted value of real wage rates for an employed worker is higher than that for an unemployed one. This makes firing more costly and provides stronger incentives for employees to work hard.[10]

In this context, contract rigidity, which parallels contractual incompleteness, manifests itself in determining frictions and lags for contractual innovations, even when they might be welfare-enhancing. Agency theory, for instance, suggests that, even if workers' effort is not verifiable, incentive-schemes, such as self-enforcing bonus or tournaments, do exist and may be adopted to motivate workers without the need of involuntary unemployment (e.g. Meccheri 2005). Contract rigidity, largely due to transaction costs, may prevent such contractual arrangements being

[10] As emphasized by Stiglitz (1992), contractual problems in capital and financial markets parallel those in the labour market. Indeed, financial market imperfections play a key role in some new Keynesian theories of macroeconomic fluctuations (e.g. Greenwald and Stiglitz 1993).

implemented, contributing to make involuntary unemployment a persistent (or an equilibrium) phenomenon.

To conclude, the concept of contract rigidity is useful for gaining insights into the sources of real wage rigidity, which, in our opinion, remains the key factor in explaining unemployment in NKE. In some sense, contract rigidities can be considered the operative device for implementing real wage (and price) rigidities. As emphasized by Stiglitz, maintaining full employment in economies characterized by great instability would presumably require large variations in real prices (wages, interest rates) and "[c]ontractual incompleteness [or rigidity] and the fact that wages, prices and interest rates are rent-based help to explain why those adjustments do not occur, or occur very slowly" (Stiglitz 1992, pp. 309-310).

4. From Contract Rigidities to Labour Market Rigidities

The above explanation of unemployment grounded on real wage and contract rigidities served as an institutional background for the so-called "wage-gap hypothesis". In the early and mid 1980s, especially in Europe, this controversial hypothesis constituted one of the main explanations for the poor economic performance in the period immediately after the two oil shocks (e.g. Bruno and Sachs 1985). According to the wage-gap hypothesis real wage rates in Europe – and to a lesser extent in the US – had outrun productivity by leading to low profitability, low investments and high (low) unemployment (employment). The theoretical underpinnings of such a proposition are indeed quite straightforward: a downward sloped labour demand coupled with any possible source of real wage rigidity that – in the case of a negative shock –

prevents the adjustment of remunerations to their full employment level is able to immediately provide a micro-founded proof of the wage-gap theorem. [11]

In spite of the huge theoretical efforts provided to offer micro-founded reasons for real wage stickiness *vis-à-vis* persistent involuntary unemployment, the wage-gap hypothesis was mainly refuted on empirical grounds. Specifically, at the same time in which sticky wages were indicated as the main culprit for massive unemployment, there began a considerable distributional shift from wages to profits (e.g. Atkinson 1999). This, on turn, led to a sharp decrease in the wage share that was not followed by a corresponding reduction in the unemployment rates. By contrast, the second half of the 1980s saw the concept of hysteresis reaching its peak of popularity (e.g. Blanchard and Summers 1986). Obviously, this was inconsistent with the original formulation of the wage-gap hypothesis.

As is well pointed out in the macroeconomics textbook by Blanchard and Fischer (1993, Chapter 9), precisely in the period in which the wage-gap theorem began to show its apparent shortcomings and its rebuttal on empirical grounds, the mainstream of the economic profession was characterized by a surprising degree of heterogeneity: there were the economists of (real and/or nominal) wage rigidities that were usually catalogued under the rubric of the NKE, briefly reviewed in Section 3; there was also a group of researchers who were well aware of the Keynesian legacy in macroeconomic modelling but whose approach to unemployment and macroeconomic fluctuations was much more heterodox and perhaps less systematic with respect to the NKE. Two leading examples of this intriguing stream of literature are the theoretical dynamic contributions by Mortensen (1982) and Diamond (1982).

Mortensen's (1982) paper considers the issue of property rights and efficiency in mating, racing and related dynamic games which underlie the presence of externalities, i.e., situations in which the actions undertaken by a single economic agent affect the production possibilities or the utility functions of all the other agents displaced in the economy. Mortensen's "innovation

[11] Downward sloped labour demand straightforwardly arises from the hypothesis of decreasing returns with respect to labour, an assumption that is usually coupled with perfect competition.

race" is a game in which a number of competitors attempt to be the first to make a specific discovery by investing in R&D. The game ends when one of the competitors actually makes the discovery and becomes an inventor. Under the assumption that exclusive patents are recognised, the investment rate of all the competitors may be too large in a Pareto sense because no one accounts for the capital loss that all but the inventor suffers when the discovery is actually made.[12] However, if the race winner were required to compensate each of the other players for the value of the expected loss, then the associated Nash equilibrium solution would be efficient. Instead, Mortensen's "mating game" is a game in which each agent seeks a partner of the opposite type, e.g., buyers and sellers or unemployed workers and employers with vacant jobs. The instantaneous probability that an agent of a given type is matched to its counterpart is assumed to be given by the sum between the agent's own search effort and a fraction of the total search effort provided by those of the opposite type. The game ends when two agents of a different type meet in order to exploit some joint production or an exchange (consumption) opportunity. Under the assumption that the surplus value of the match is divided equally between the partners, the search effort of the agents may be too small in a Pareto sense because no one accounts for the share of the surplus gained by the future partner to whom he/she will be matched. However, if each agent were to receive the share of surplus corresponding to his/her own search effort, then the associated Nash equilibrium solution would be efficient.

Diamond's (1982) paper can be effectively described by referring to the tropical island metaphor that is usually exploited to expound the profound meaning of its formal dynamic framework. Specifically, consider a simplified multi-person economy in which a certain number of agents walk around the beach of a tropical island in which there are some coconut trees that differ in height. At the top of each tree there is a coconut and whenever an agent decides to pick it, he/she has to incur the disutility (or effort) of climbing up it; the taller the tree, the higher the disutility of climbing. Once an agent has picked

[12] Under the hypothesis of exclusive patents, the inventor can privately exploit all the value raised by the discovery.

the coconut, he/she has to start to search for another agent in the same position around the island in order to swap the picked coconut because eating fruits directly taken from trees is assumed to be a taboo.[13] Whenever the agent finds a trading partner, they eat the picked coconuts and start another search for trees with fruits. Obviously, this tale can be used as an extended metaphor for a model economy in which there might be coordination failures. In fact, Diamond (1982) suggests that in environments like that described above, there might be multiple steady-states – or different natural rates of unemployment in Friedman's (1968) words – with different levels of activity in spite of perfect wage flexibility and the absence of any price misperception. Specifically, there might be low-level equilibria in which agents decide to climb only up short trees so that it will be difficult to find trading partners. By contrast, there might be high-level equilibria in which agents are also willing to climb up tall trees such that it will be quite easy to find a trading partner.

The implementation of the suggestions put forward by Mortensen (1982) and Diamond (1982) into a genuine macroeconomic framework came along with a certain impatience for the Walrasian setting implicitly revisited by the NKE economists who stressed the role of real wage rigidity in explaining persistent involuntary unemployment. This argument is well described by the following passage by Lucas: "If we are serious about obtaining a theory of unemployment, we want a theory about unemployed people, not unemployed 'hours of labor services'; about people who look for jobs, hold them, lose them, people with all the attendant feeling that go along with these events. Walras' powerfully simple scenario, at least with the most obvious choice of 'commodity space' cannot give us this, with cleared markets or without them" (Lucas 1987, p. 53). The straightforward interpretation of this piece is that it seems quite difficult to model the labour market as a simple (spot) auction market in which real wage and employment are jointly determined through the interaction of labour supply and labour demand.

[13] This assumption is meant to represent the advantages of specialised production and trade over self-sufficiency.

5. Search Models of Equilibrium Unemployment and Labour Market Institutions

Drawing mainly on the works by Diamond (1982) and Mortensen (1982), Pissarides (1985; 2000) built and popularized the so-called search/matching framework or transactional approach to unemployment.[14] According to a widespread interpretation, and in sharp contrast to the NKE approach, the unemployment equilibrium that emerges and persists in search models is not the result of nominal and/or real rigidities, but a consequence of what is usually labelled as *labour market (institutions) rigidities*. As suggested by Solow (1998, p. 190), under this generic rubric we might find labour market institutions such as excessive unemployment-insurance benefits, restrictions on the freedom of employers to hire and fire, tightly regulated hours of work, excessively generous compensations for overtime work, excessively strong trade unions that protect incumbent workers against competition and control the flow of work at the side of production and perhaps too stringent statutory health and safety regulations. In general, labour market rigidities result in all the *frictions* associated to specific institutions that, in addition to promoting certain social purposes, allow unemployed workers and vacant jobs posted by firms to coexist in equilibrium.[15] Moreover, such frictions do not necessarily (or they do not seem to) imply real wage rigidity.

In the macroeconomic search framework the actual operation of labour market rigidities (or frictions) is summarised by an exogenous matching function, i.e., a formal device similar to a production function that matches unemployed searching workers with employers with vacant jobs by taking into account the trading externalities faced by each parts. On the one hand, unemployed searching workers face a "thick" market externality in the sense

[14] See also Mortensen and Pissarides (1994).

[15] Obviously, in a Walrasian setting this simultaneity will be hard to explain in a consistent manner.

that the higher the employment level, the easier it is to find a vacant job. On the other, employers with vacant jobs face a "thin" market externality in the sense that the lower the employment level, the easier it is to fill an open vacancy.[16] The corresponding matching probabilities arise from the properties of the matching function (see Petrongolo and Pissarides (2001) for a survey).

Under the assumption of a constant instantaneous job separation rate, i.e., an exogenous hazard rate for employment contracts, the matching function can also be used to derive the out-of-equilibrium dynamics of the unemployment rate. Moreover, whenever the matching function displays constant returns to scale, an assumption that the empirical literature has found hard to reject (e.g. Blanchard et al. 1989), it may be shown that the stationarity locus of this dynamic law defines a negative equilibrium relationship between job vacancies and unemployment usually labelled as a Beveridge curve.[17] Finally, the actual vacancies-unemployment pair on the Beveridge curve is selected through the intersection of an upward schedule starting from the origin that summarises the non-predetermined firms' decisions concerning vacancy opening.[18] As long as frictions are stringent, i.e., as long as jobless workers and firms with vacancies can coexist, the equilibrium allocation will entail persistent unemployment.

Once the match between a searching unemployed worker and a firm with a vacant job has been made, the economic rents generated by the trading externalities summarised by the matching function are split between the worker and his/her employer through a generalised Nash bargaining process that is meant to represent actual wage negotiations and allows the model to be closed by deriving a fully-flexible real wage rate. Obviously, as suggested in

[16] It is worth noting that the notion of "thin" and "thick market externalities" comes directly from Diamond's (1982) contribution.

[17] In *Full Employment in a Free Society*, Beveridge (1944) defined full employment as a state of affairs in which the number of vacant jobs is equal to the number of unemployed workers. As a consequence, in a vacancy-unemployment diagram, the full employment allocation would be found at the intersection between the Beveridge curve and a 45-degree line from the origin. A negative equilibrium relationship between job vacancies and unemployment was derived by Hansen (1970) from more primitive assumptions on the frictions of an auction labour market.

[18] From a formal point of view, this schedule is obtained by imposing the stationarity of the vacancy-unemployment ratio.

Mortensen's (1982) mating game, whenever the surplus share assigned to each part differs from the corresponding search effort, the equilibrium allocation is not Pareto-efficient. [19] Generally speaking, the higher (lower) the workers' bargaining power, the higher (lower) the equilibrium real wage rate and – for a given value of the exogenous separation rate – the lower (higher) the vacancy rate and the higher (lower) the unemployment rate.

The central message underlying the search framework for the explanation of unemployment has been widely recognized. For example, the OECD (1994) *Jobs Study* pointed to labour market rigidities as one of the main reasons for the different unemployment patterns recorded worldwide. Specifically, labour markets with higher (lower) degrees of rigidity should also have higher (lower) unemployment and lower (higher) employment. In addition, since the 1990s, the view according to which labour market rigidities – instead of excessive or rigid real wage rates – are to be indicated as unwanted barriers to higher employment and growth has also found credence among central bankers. A good example is given by the remarks made by the Federal Reserve Governor Laurence H. Meyer before the 1999 World Economic Forum when he explicitly stated that "European policymakers will now have to focus more on structural changes needed to deal with Europe's labor market rigidities in order to ensure continued healthy economic expansion in the longer term" (Meyer 1999).

6. The "Unexpected" Role of Real Wage Rigidity in Search Models

In recent years, the Mortensen-Diamond-Pissarides (MDP) search and matching model has become the standard theory of equilibrium unemployment. The model has proved attractive for a number of reasons. First, it offers an

[19] The condition for the implementation of Pareto efficiency in the search framework is discussed by Hosios (1990).

appealing description of how (un)employment evolves over time. Second, it is analytically tractable and has an intuitive comparative statics. Finally, it can easily be adapted to study a number of labour market policy issues, such as unemployment insurance, firing restrictions and wage bargaining regulation.

Taking such theoretical successes into account, it seems almost natural to ask whether the model is also able to match the actual behaviour of the main variables involved, i.e., unemployment, job vacancies and real wage rates. Indeed, there is a very influential paper (Shimer 2005) that questions the predictive power of the standard MDP matching model by arguing that its theoretical framework cannot generate the observed business-cycle-frequency fluctuations in unemployment and vacancies in response to real productivity shocks of plausible magnitude.

Using quarterly data from different sources, Shimer (2005) measures the autocorrelation and the volatility of unemployment, job vacancies and real wage rates for the US economy in the period from 1951 to 2003. One of the most striking findings of this empirical exploration is that the standard deviation of the vacancy-unemployment ratio – usually referred to as the labour market tightness indicator – is almost 20 times as large as the standard deviation of real wage rates over the period under examination. The so-called "Shimer's puzzle" arises from the fact that the standard MDP model, in which real wage rates are the outcome of a generalized Nash bargaining process, predicts that the two variables (labour market tightness and real wage rate) should have nearly the same volatility. The intuition for this result is that a real wage rate bargained between the worker and the employer according to the Nash rule absorbs a great deal of productivity shocks. As a consequence, vacancies and unemployment are only partially affected by the stochastic disturbances that affect the real value of produced output.

An initial important stream of contributions, such as Hall (2005a; 2005b) and the very Shimer (2005), sought to reconcile the MDP matching model to data by introducing some real wage rigidity in order to generate a stronger amplification of real shocks, i.e., in order to amplify the effects of

productivity shocks on labour market tightness indicators. Despite taking different routes, the authors in question appear to arrive at similar conclusions.

Hall (2005a; 2005b) embeds real wage stickiness within the MDP model by observing that productivity shocks cause a movement in the boundaries of the so-called "bargaining set" for wage determination, i.e. the gap between the minimum wage acceptable for the worker and the maximum wage acceptable to the corresponding employer. Any real wage rate inside the bargaining set will result in the efficient formation of a match in the sense that no worker-employer pair has an unexploited opportunity for mutual improvement. [20] Given the operation of the search frictions summarised by the matching function, it is also shown that the typical bargaining set is a non-empty thick set in which the Nash bargaining rule acts just as an equilibrium selection device. More precisely, the Nash bargaining process sets the wage at a weighted average of the limiting wages, with a fixed weight over time. Obviously, any wage norm that establishes a sticky real wage rate that varies over time, but not by as much as does the Nash wage, will represent another legitimate equilibrium selection device if the implied remuneration path is always constrained inside the corresponding bargaining set. [21] Simulating a matching economy in which the real wage follows a wage norm of that kind, Hall (2005a; 2005b) shows that the MDP model can be easily reconciled with Shimer's puzzling empirical findings.

By contrast, Shimer (2005) shows that the MDP model can be reconciled with the US empirical evidence without abandoning the flexible Nash bargaining solution but simply assuming that the workers' bargaining power – usually assumed to be fixed – moves counter-cyclically. Obviously, this might generate a fairly stable real wage rate because in expansion (recessions) remuneration would tend to go down (up) because workers would become contractually weaker (stronger). However, Shimer (2005) fails to provide any micro-founded reason for such an unusual link.

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[20] As a consequence, Hall (2005a; 2005b) provides also an answer to Barro's (1977) condemnation of sticky-wage models by invoking an inefficiency that rational agents could easily avoid.

[21] To be precise, Hall (2005a, p. 64) suggests that this result can be achieved through a partially smoothed wage and/or an adaptive wage.

If the contributions briefly reviewed in this section go in the right direction, we can conclude that even the MDP search model needs some wage (and price) rigidity in order to explain the behaviour and persistence of unemployment in real world economies. This finding suggests some interesting considerations. At a first approximation, it seems hard to disentangle labour market rigidities (or frictions) from real wage stickiness. In fact, as suggested by Stiglitz (1992) and already stressed in Section 3, the existence and persistence of the economic rents generated by the frictions summarised by the matching function are likely to be reinforced by the existence and persistence of wage and price rigidities. Second, real wage stickiness is quite likely to be called in to play some meritorious role that has to be traded by means of a social welfare function against higher (lower) unemployment (employment). In fact, a number of the labour market institutions responsible for the frictions that allow unemployed workers and vacant jobs to coexist in equilibrium are intended – at least in principle – to promote some desirable social purposes. As a consequence, if real wage stickiness is the device that effectively allows their maintenance, workers – and to some extent also entrepreneurs – may well resist real wage cuts in order to maintain what we might call a "fair equilibrium". This concept was pioneered by Marshall (1887) and revisited, in a game-theoretical framework, by Solow (1990). In the labour market, a fair equilibrium is an allocation in which unemployed workers do not underbid incumbent workers because they expect to be employed in another (future) period of time, in which they will receive a real wage rate higher than their opportunity cost of labour. [22] According to Solow (1990), the threat that allows such an equilibrium strategy to be maintained is the "brutish state" that would prevail in a free-for-all (Walrasian) competitive equilibrium.

Finally, some flavour of attractiveness for real wage stickiness also comes from more technical considerations. As suggested by Hahn and Solow (1986; 1995), a monetary OLG economy with perfect real wage flexibility – and nothing prevents extending this result to a matching economy emended to

[22] Obviously, this kind of "cooperative" equilibrium requires that the gains from pure insider bargaining are large enough and the future is not too heavily discounted.

include money and inter-temporal consumption choices – can be so intrinsically unstable that the raising of a generic real shock may lead to endless or (worse) diverging fluctuations in the real interest rate that bring about meaningless swings in the inter-temporal distribution of welfare. [23] Therefore, even if they ensure continuous full employment, such fluctuations have no claim to be equitable and are more likely to be seen as undesirable. Indeed, Hahn and Solow (1986; 1995) show that there exists an optimal policy that minimizes the magnitude of fluctuations and that such a policy, combining monetary and fiscal factors, acts essentially as a wage-price stabilizer.

7. Concluding remarks

The aim of this paper was twofold: firstly, it surveyed and critically discussed partial changes in the relevant concept of labour market rigidity/flexibility, particularly in relation to unemployment (e.g. flexibility of nominal or real wage, of labour contracts and labour market institutions). Secondly, it critically assessed the factors that lead labour market rigidities, stressed by the search framework popularized by Pissarides (1985; 2000), to challenge the New Keynesian wage rigidity approach in the common-sense explanation of equilibrium unemployment. Special importance was attached to the macroeconomic modelling strategies pursued by these two streams of literature. Finally, following the empirical insights in recent contributions by Shimer (2005) and Hall (2005a; 2005b), we addressed the tricky role of wage rigidity inside the search theoretical framework.

One of the most important findings of our critical discussion about the concept of labour market rigidity is probably the two-fold role played by real wage rate stickiness in explaining unemployment (and adverse business

[23] In this framework there are eligible values of the capital share, the consumption elasticity of substitution and the money circulation velocity such that the stationary solution is unstable. Formal proofs are given by Guerrazzi (2007).

fluctuations).[24] On the one hand, real wage stickiness is the device that allows the creation and persistence of the economic rents required for the actual functioning of labour market institutions that might perform meritorious social purposes. On the other, labour market institutions create frictions that are responsible for equilibrium unemployment. As a consequence, any attempt to introduce higher flexibility in the form of lower real wage rates or – more in general – labour market deregulation may well alleviate unemployment and boost employment in the short run, but it may also lead to undesired social outcomes. For example, a recent work by Bertola and Lo Prete (2009) suggests that all over the major OECD countries, labour market deregulation is associated with higher employment and faster growth but also with lower consumption and increasing income inequality. Along these lines, Boeri (2008) notes that in Europe labour market deregulation led to an increase in employment and a decrease in unemployment rates but this came without any significant increase in GDP levels and with a deterioration of social cohesion. Such arguments may raise some major doubts about the possibility of such policies to stimulate and raise employment levels in a longer-run perspective. Moreover, if stable real wage rates – via labour market institutions – help pursue meritorious social purposes such as income equality and cohesion, it might be worth preserving them by means of policies (e.g., investing in infrastructures, productive capital and active labour market policies) that lead to increasing productivity in order to mitigate their costs in terms of unemployment.

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[24] The increasing need for labour market flexibility in a context of economic and monetary union, such as the European Monetary Union (EMU), is strongly advocated by Pissarides (1997). He also points out that since the most important constraints imposed by the EMU are nominal (i.e. fixed exchange rate and exogenous monetary policy), this mainly requires an increase in *nominal* wage (and price) flexibility.

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