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**MACRO-DETERMINANTS OF UK REGIONAL UNEMPLOYMENT
AND THE ROLE OF EMPLOYMENT FLEXIBILITY#**

Abstract

This paper explores the macroeconomic determinants of UK regional unemployment and their relation to the influences on unemployment exerted by the levels and types of employment flexibility in the country. Theoretically the paper draws on Keynesian and monetarist explanations of unemployment and elaborates on how the two main theoretical approaches perceive the role of price stability, accumulation, macroeconomic shocks and labour market rigidities for unemployment. Empirically, the analysis relies on a novel set of flexibility indicators and examines their impact on regional unemployment, unemployment persistence, and adjustment to economic shocks. The results provide useful insights into the explored relationships and highlight the areas and conditions under which employment flexibility helps achieve favourable employment outcomes. The implications of the findings are discussed in the concluding section.

Keywords: Employment flexibility, regional unemployment, persistence, NAIRU and Keynesian explanations of unemployment

JEL codes: E12, E24, J64, R11, R38

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1. Introduction

There is a large and expanding literature examining the relation between institutional labour market arrangements and their impact on economic and labour market outcomes. In the macroeconomic literature, in particular, voluminous research has investigated the role of labour market institutions in explaining cross-country and temporal differences in unemployment in Europe and the OECD, an issue of acute interest given the persistently high unemployment in Europe, compared at least to the USA, over the last two decades or so. Two key characteristics of this literature are the use of ordinal indexes of the quality (i.e., rigidity) of labour market institutions and the use of a macroeconomic framework that relies heavily on the NAIRU theory of unemployment.

Within this framework, labour market rigidities are seen as a factor that impacts adversely on the frictionless operation of the labour market and thus contributes directly to raising the structural element of unemployment. Net of cyclical fluctuations, that are conventionally associated with demand shocks and temporary monetary expansions (or contractions), countries or periods with more rigid labour market institutions exhibit higher rates of unemployment. A number of influential empirical studies have examined and provided supportive evidence for this relationship (Grubb and Wells, 1993; Scarpetta, 1996; Nickell, 1997 and 1998; Elmeskov et al, 1998; Nickell and Layard, 1999; Belot and Van Ours, 2000). Although their results are not uniform, a general consensus appears to prevail that institutional rigidities, especially relating to weak coordination in wage bargaining, long duration of unemployment benefits and, less so, strict employment protection legislation, are significant explanations for the observed patterns of high and persistent unemployment in many of the large European economies.

More recently, the focus of this macroeconomic literature has shifted from explaining differences in the structural element of unemployment to focusing on the impact of labour market rigidities on the

cyclical element, i.e., on unemployment adjustment to macroeconomic shocks. The work of Blanchard and Wolfers (2000), Adsera and Boix (2000), Fitoussi et al (2000), Bertola et al (2002) and Amisano and Seratti (2003) has shown that labour market institutions significantly impact on unemployment adjustments to adverse shocks, thus raising unemployment.¹

In one of the few attempts to differentiate from the standard NAIRU-based analysis, Stockhammer (2004a and 2004b) examines jointly the role of monetary (price) adjustments and patterns of accumulation, as well as of labour market rigidities, for European and US unemployment. The role of accumulation is highlighted as it deviates from Neoclassical and New Keynesian explanations of unemployment and instead relates more firmly to a Post-Keynesian view of the world, where unemployment is seen as a disequilibrium condition, which results from the disparity between the physical expansion of the economy (capital growth) and the rate of growth of the workforce. Stockhammer's results suggest that labour market rigidities have only a weak effect on unemployment and that the slowdown of accumulation in Europe is by far the most significant determinant of European unemployment.²

Despite the differences in their policy prescriptions, the aforementioned studies share a number of caveats. First, they rely almost exclusively on subjective measures of the quality or strictness of labour market institutions. Apart from questions as to how successfully these measures reflect the actual quality and meaning of the institutional settings of the countries concerned,³ in any case, the direct association

¹ On the other hand, Nickell et al (2002) and Nunziata (2002) find conflicting evidence, suggesting that labour market rigidities impact mainly on the structural rather than the cyclical element of unemployment. The empirical analysis of Baker et al (2002) provides strong criticism on both sets of results.

² See Davidson (1998) for a detailed exposition of the Post-Keynesian analysis of the relation between slowdown in accumulation and unemployment, with particular emphasis on European unemployment.

³ Arguably, country heterogeneity in a number of areas (including, e.g., attitudes towards unionism and non-standard forms of employment, or the social role of families and informal networks) implies that similar institutions can obtain very different functions and meanings in different countries.

between labour market institutions and actual levels of labour market flexibility is problematic both conceptually and empirically (Solow, 1998; Monastiriotis, 2003). Second, such studies rely on the assumption that the unemployment relationship is the same across the sample countries (typically the OECD or a sub-set of European economies), an assumption that has been shown elsewhere to be far from justified (Hall and Soskice, 2001). Clearly, countries differ not only in their labour market institutions, but also in the framework in which key macroeconomic (fiscal, monetary) and microeconomic (housing, education, redistribution) policies are conducted. Such structural differences can have significant implications for the impact that labour market institutions and other macroeconomic variables have on unemployment. Finally, these macroeconomic studies tend to overlook within-county differences in both unemployment performance and labour market flexibility. Such differences are in general large and often more pronounced than cross-country differences. Thus, they deserve a closer and more systematic examination.

This paper takes these considerations into account and successfully addresses the above caveats. While it adopts a macroeconomic framework similar to the studies reviewed above, it introduces a number of critical innovations in the analysis of the empirical relationship between unemployment and flexibility. Flexibility is defined as a measurable and directly observable outcome rather than a set of regulations and institutions; the labour market is defined at the sub-national level, its boundaries identified with those of the administrative region; the focus shifts to a single country – the UK – and thus government regulations and other institutional differences are held constant across the cross-sectional dimension of the sample; and a fixed set of flexibility indicators are used, relating to the internal, external, numerical, and functional elements of the organisation of the labour relationship in the production process. These theoretical categories of flexibility are directly related to the types of flexible labour use that have been identified in the early literature

(Atkinson, 1984; Atkinson and Meager, 1986) and are empirically measured on the basis of survey data from the annual and quarterly series of the UK Labour Force Survey, covering the period 1985-2004 and aggregated at the regional level (source Monastiriotis, 2004).

Based on this unique set of flexibility indicators, the present paper addresses four sets of inter-related questions regarding the impact of flexibility on unemployment. First it seeks to establish what is the relative importance of a number of macroeconomic variables, relating to alternative theoretical explanations of unemployment, for regional unemployment in the UK over the last twenty years. Second, it examines the impact that, controlling for these macro-determinants, observed levels of flexible employment arrangements have on UK regional unemployment. Further, it investigates the impact of such arrangements on unemployment persistence and adjustment to macroeconomic shocks and other cyclical and structural influences. Finally, it examines the role that more disaggregate categories of flexibility play for regional unemployment, as well as unemployment persistence and adjustment, and further explores the impact that the mix of these disaggregate categories has on the prevailing levels of regional unemployment in the UK. The regional labour markets of the UK exhibit some interesting characteristics, most notably a very high degree of unemployment persistence, a notable degree of temporal synchronicity, and comparatively low degrees of inter-regional adjustment. While addressing the above questions, about the relationship between unemployment and flexibility, the present paper also helps identify some macroeconomic and regulatory influences that shape these characteristics of the UK regional labour markets.

The next section discusses some theoretical issues regarding the conceptualisation and measurement of flexibility and briefly presents the indicators that are used in the empirical analysis. Section 3 elaborates on the theoretical explanations of unemployment and develops an estimating model that nests within it the simple NAIRU and Keynesian models. The

empirical analysis is presented in section 4, while the last section summarises the results and concludes with some policy implications.

2. The measurement of flexibility

Despite the vast interest and research into the issue, a universal working definition of flexibility is significantly lacking in the literature. The macroeconomic literature focuses predominantly on the strictness of labour market institutions, implicitly (and sometimes explicitly) assuming a one-to-one relationship between institutions and flexibility. In a similar fashion, most of the labour economics studies focus on few measurable characteristics of labour relations, like the (value of) minimum wages; union density and coverage; and the strictness of unemployment benefits, labour market programmes and dismissal practices. Again, such characteristics are assumed to reflect directly labour market flexibility. In contrast, much of the research in the broader area of labour studies looks at specific labour market arrangements that are more directly related to flexible employment practices, like part-time and temporary work, unpaid overtimes, annualised hours, multi-tasking and the like.

This diversity in the adopted working definitions of labour market flexibility is partly due to the relative ambiguity of the concept, in relation to three key questions. First, *what constitutes labour market flexibility?* Alternative views would see flexibility as a set of relationships describing the production process, the operation of demand and supply in the labour market, the treatment of unemployment, or the employment contract (i.e., wages, benefits, promotion structures, etc). These views are not always easy to reconcile and, more importantly, it is not a priori clear how they can be combined to form what can be commonly understood as labour market flexibility. Second, *what is the counter-factual of flexibility?* Often flexibility is seen as the exact opposite of regulation, in the sense of a perfect symmetry between the two, so that the counter-factual of flexibility is ‘too much legislation’ and employment regulations – even if these regulations are not in themselves directly creating labour market

rigidities. Third, *what is the substance of labour market flexibility?*

Flexibility can be understood as a potential (available to the actors involved in the labour process, but only utilised when and as required), as a contextual framework (regulations and institutions that set the limits within which employer-employee relationships can be established), or as an outcome (the product of the interaction between regulations, institutions, economic structures and labour market conditions).

Related to the above, is a more empirical question, concerning the measurement of flexibility. Is flexibility an observable labour market characteristic or is it a latent qualitative variable? And, if it is the latter, can it be measured and how? What describes flexibility best: the regulators' rules, the employers' perceptions, or the workers' attitudes and actions? Against these questions, the paper adopts a rather ad hoc definition of labour market flexibility, which differentiates between flexibility and government regulations. To view changes in legislation (deregulation) as direct evidence of increased flexibility in the labour market fails to acknowledge the fact that flexibility is conditioned on a range of factors outside regulation and, thus, that the two are not equivalent (Pollert, 1991, Solow, 1998). Flexibility can increase without changes in regulation (i.e., if other rigidities are removed, including those targeted by some government regulations, like monopsony and insider power), while deregulation can occur without subsequent changes in observed levels of flexibility (Brosnan and Walsh, 1996; Ozaki, 1999).⁴ It thus follows that deregulation is neither a sufficient nor a necessary condition for increased flexibility.

This view of flexibility helps us move from associating attributes of flexibility with specific labour market institutions to, instead, examining directly the revealed levels of flexibility in the labour market. Following, flexibility is defined as a set of directly observable employment

⁴ Addison and Hirsch (1997) discuss such an empirical case for mandatory advance dismissal notices in the USA, where deregulation did not lead to increased flexibility in the employers' dismissal practices, with the implication that apparently the pre-deregulation arrangements were closer to optimal at least from a firm, if not a social, perspective.

arrangements that deviate from the standard employment relations that had come to characterise the era of Keynesian regulation (expansion of waged labour and the welfare state). This set of arrangements can cover a seemingly endless list, including arrangements on working time (length of working day/week, annualised hours contracts, overtime, variable or irregular hours), working structures (based on shifts, covering weekends or performed from home; seasonal, occasional, task-related, or fixed-term contracts; part-time employment; multi-tasking; team-working; sub-contracting), employment conditions (absences, breaks, paid and unpaid leave, minimum benefits, working standards, pace of work, provision of childcare facilities), wage determination (employee participation, union recognition, wage bargaining and strikes, unemployment benefits), and labour adjustability (mobility across jobs, labour markets, occupations and industries; skill-acquisition and re-training).

This long list can be organised in a number of groups of flexible labour market arrangements that relate to broader domains of flexibility. Numerous such approaches have been offered in the literature, with minor or less minor variations (for example, Atkinson, 1984; Pollert, 1991; Dawes, 1993; Ozaki, 1999; Burchell et al., 1999; Weiss, 2001). In a previous study on UK flexibility, Monastiriotis (2003) synthesised the classifications produced by such approaches into three aggregate domains. The production function or *employment flexibility* domain included elements relating to the production process, for example arrangements on working time, work content, and the employment relationship (temping, part-timing, etc). The *labour costs* domain included those aspects that relate to the determination of wage and non-wage labour costs, including unionism, the wage elasticity of unemployment and the relationship of non-wage costs to overall labour costs. The third domain captured individual or *labour supply flexibility*, incorporating the quantitative and qualitative elements of labour supply adjustments, i.e., measures of worker mobility and skills acquisition respectively.

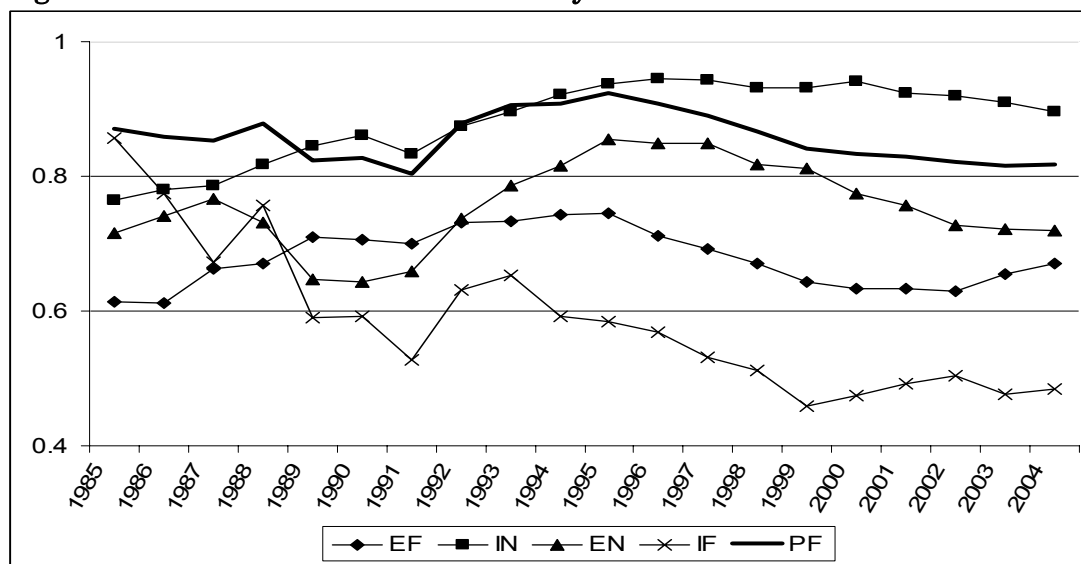
The present study focuses on the first of these domains (production function flexibility) and provides a further classification of its various elements, based on an adaptation of the traditional distinctions introduced in the early literature of the ‘flexible firm model’ (Atkinson, 1984; Atkinson and Meager, 1986; see also Weiss, 2001). Thus, four types of production function flexibility are identified, derived from the interaction of two basic distinctions: functional versus numerical (or operational versus tactical) and internal versus external flexibility. These distinctions produce four types of flexibility that, while focusing on the production process, acknowledge the qualitative differences between, say, enhancing the adjustability of the labour input (numerical) and increasing its adaptability to changing tasks and methods of production (functional – which might in fact reduce numerical adjustability), or between multi-tasking (internal) and sub-contracting (external). In other words, by identifying within the production process these four types of flexibility, one not only can differentiate between the numerical and functional aspects but also account for the fact that these aspects produce different forms of labour arrangements and different types of ‘flexibilities’ when applied to a structurally (internal) or only contractually (external) integrated workforce. In this paper we use these indicators of employment flexibility as have been constructed in Monastiriotis (2004).⁵

The indicators reveal some very interesting patterns regarding the evolution and geographical distribution of employment flexibility in the UK. Figure 1 depicts the temporal evolution of the aggregate measure of

⁵ These indexes have been constructed from individual-level data derived from the annual Labour Force Survey and the spring wave of the Quarterly Labour Force Survey series (for 1985-1991 and 1992-2004 respectively). The data have been aggregated at the regional level using the twelve Standard Statistical Regions of the UK as the unit of analysis. Internal numerical flexibility is measured by the proportions of employees working shifts, weekends, and variable or irregular hours; the share of overtime to normal hours; and the share of involuntary part-timing or involuntary over-employment to total part-timing and total working hours respectively. Internal functional flexibility is captured empirically by the proportion of workers changing occupation while remaining with the same employer (within-job occupational mobility). External numerical flexibility combines the proportion of temps and part-timers in the employed workforce and the proportion of involuntary temping. Finally, external functional flexibility is proxied by the share of self-employment. For further details on the data and the construction of the indexes see Monastiriotis (2004).

flexibility and its four sub-categories and shows that largely flexibility exhibits a cyclical behaviour while its constituent elements do not follow identical trends. Flexibility seems to have contracted in the beginning of the early-1990s recession and again decline or stabilise since the mid-1990s.⁶ Although much of this pattern can be attributed to the significant decline in internal functional flexibility, other elements, namely those related to external flexibility also exhibited a downward trend around the turn of the century. Numerical flexibility has been increasing faster (and then declining more slowly) over the period and thus its relative importance to overall production function flexibility increased.

Figure 1. Production function flexibility in the UK



Interestingly, the evolution of all elements of flexibility does not exhibit any apparent structural breaks that could be associated to changes in labour market regulations, although the declining trend after the mid-1990s could be related to the introduction of a number of more rigid employment regulations by the Labour governments (e.g., maternity leave, working hours, minimum wage). It follows that, to the extent that regulations actually have a direct impact on flexible employment

⁶ Unemployment has been declining in the UK since the late 1980s, with the notable exception of the 1990-1993 recession, when unemployment almost doubled.

arrangements, this impact operates through a gradual adaptive process and not contemporaneously, in line with the earlier observation that flexibility is not identical to labour market deregulation.

Figure 2. Elements of production function flexibility, 2001-2004

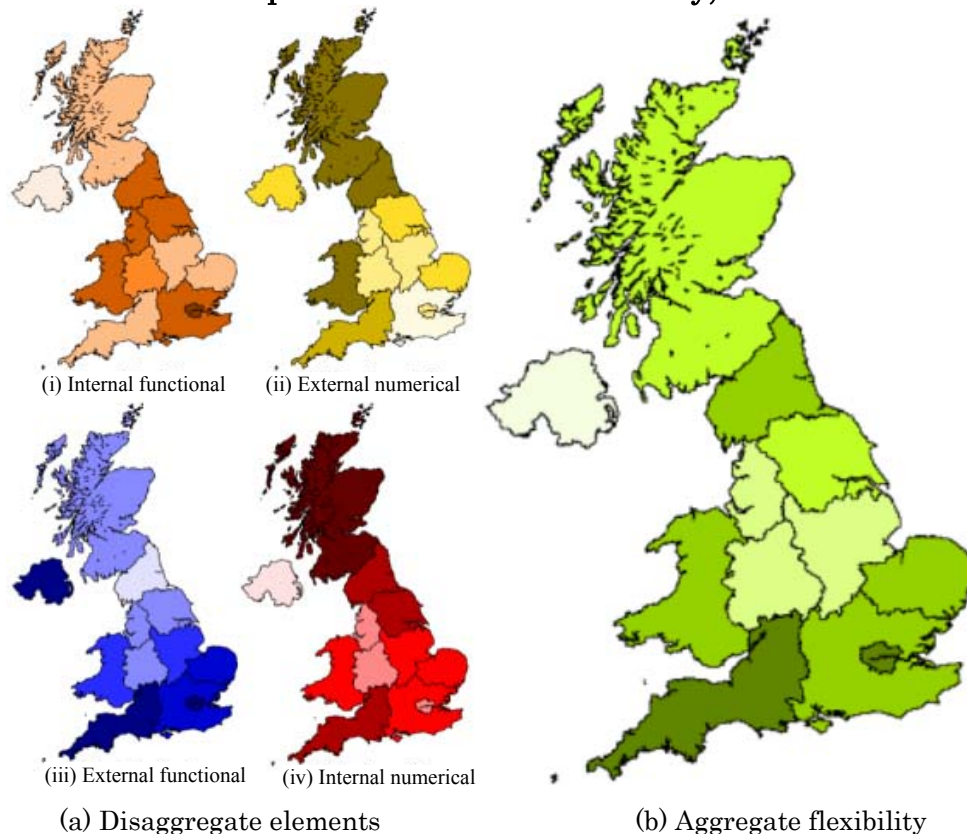


Figure 2 depicts the regional variation of the four types of employment flexibility and of the aggregate measure. A pattern of North-South differentiation in both levels and types is apparent. Internal functional (Figure 2a(i)) and external numerical (Figure 2a(ii)) are more prominent in the north of the UK while the southern regions show higher shares of external functional flexibility (Figure 2a(iii)). Internal numerical flexibility (Figure 2a(iv)) exhibits a rather different pattern, being more prominent in the north and outside the north-western and mid-western areas of England. The end result of these disaggregate patterns (Figure 2b) is a mixed picture of geographical differentiation, where the middle of the country appears as the area with the lowest levels of flexibility. The south exhibits a relative functional specialisation in elements of external

functional flexibility, while most of the other elements are more pronounced in the northern parts of the country, so that the Midlands have on aggregate the lowest levels of flexibility.⁷

This regional differentiation is not uncharacteristic of the UK geography. Regional unemployment rates in the north of the country are consistently higher to those of the south. With the exception of London (which, since the recession of the early 1990s, has also exhibited above-average unemployment rates) this disparity has been substantially stable, with the rank correlation of regional unemployment rates taking a value of 0.83 for the twenty-year period. The next section considers the theoretical explanations of unemployment (and of how the latter relate to flexibility) thus providing a framework for the empirical examination of the relation between the observed temporal and geographical patterns of unemployment and flexibility.

3. Theoretical considerations and estimating model

Mainstream economic theory provides a strong rationale for a negative association between flexibility and unemployment. Flexible labour markets are characterised by lower frictions and adjust faster to economic shocks. Both of these factors contribute to lower structural, frictional and overall unemployment rates. Although this analysis is not incompatible with the standard neoclassical view, it more emphatically reflects the predictions of the NAIRU model, where an equilibrium level of unemployment compatible with price stability (i.e., non-accelerating inflation) exists and is determined by the degree of frictions operating in the labour market. Deviations from the equilibrium are due to unanticipated macroeconomic shocks but adjustment to equilibrium is itself adversely affected by labour market frictions.⁸ Labour market

⁷ Monastiriotes (2004) further presents some interesting patterns regarding the temporal evolution of the geographical distribution of flexibility in the UK, which largely suggest relative convergence in terms of internal and relative divergence in terms of external flexibility elements.

⁸ See, among others, Pissarides (1990), Hoon and Phelps (1992), Phelps (1994) and Scarpetta (1996).

rigidities are a significant part of such frictions and thus the actual and equilibrium rates of unemployment are both inversely related to labour market flexibility.

Such a theoretical understanding of unemployment is in stark contrast to the Keynesian approach, which sees unemployment as a disequilibrium condition. In the simple Keynesian approach unemployment is due to the disparity between effective and equilibrium demand. This disparity leads to a rate of accumulation that cannot maintain a rate of output and employment growth in line with the natural rate of (population) growth. In this setting, labour market frictions in the form of labour market rigidities can play only a minor part in explaining unemployment: to the extent that rigidities do not impact on the rate of accumulation, unemployment should be unrelated to labour market flexibility.

Thus, in the simple Keynesian approach the unemployment rate changes according to the distance between the natural and actual rates of growth. While the former is treated as exogenous, the latter depends on the rate of capital accumulation. It follows that the level of unemployment at each point in time will depend on the (exogenous) natural rate of growth, past unemployment and the rate of accumulation. If we assume the natural rate of growth to be constant, a stochastic formulation of this relationship can be written as follows:

$$u_t = a_0 + a_1 u_{t-1} + a_2 \Delta k_t + \varepsilon_t \quad (1)$$

where u is the unemployment rate (in logs), t indexes time, Δk is the rate of growth of capital (accumulation) and ε is an error term.

Although equation (1) does not allow for a role of labour market rigidities in determining unemployment, a possible link between the two can be provided by assuming that rigidities impact on the effect that accumulation has on employment growth and thus on unemployment. In other words, it can be reasonably assumed that accumulation is a stronger driver of employment growth the more rigid the labour market; alternatively, that in flexible labour markets unemployment should

respond less to changes in the rate of accumulation. Algebraically this implies that

$$u_t = a_0 + a_1 u_{t-1} + a_{21} \Delta k_t + a_{22} (\Delta k_t F_t) + \varepsilon_t \quad (1')$$

where we have substituted $a_2 = a_{21} + a_{22} F_t$ and F_t is a variable measuring labour market flexibility. In equation (1') $a_{21} < 0$ and $a_{22} > 0$ reflecting the assumption that accumulation reduces unemployment but less so in flexible labour markets.

In contrast to the Keynesian model, as stated already, the NAIRU approach is an equilibrium one and thus the rate of accumulation does not play a role in the determination of unemployment. Instead, actual unemployment depends on the structural rate of unemployment, u^* , and on cyclical factors and exogenous shocks. Formally, the structural element of unemployment can be represented as a function of labour market rigidities while, as is standard in the relevant literature, cyclical influences and macroeconomic shocks are approximated with the change in the inflation rate ($\Delta \pi$) and the rate of growth of productivity (Δv) respectively. Thus, a formal representation of the NAIRU model can be given by

$$u_t = b_0 + b_1 u_{t-1} + b_2 \Delta \pi_t + b_3 \Delta v_t + b_4 F_t + \eta_t \quad (2)$$

As was mentioned earlier, relatively recent works in the field, mainly empirical but also theoretical, have also highlighted the impact on unemployment and unemployment persistence of the interaction between macroeconomic shocks and labour market institutions (Scarpetta, 1996; Blanchard and Wolfers, 2000; Adsera and Boix, 2000; Fitoussi et al., 2000; Bertola et al., 2002; Amisano and Seratti, 2003). Following, equation (2) can be amended to include the other possible influences of labour market rigidities on unemployment, namely through its impact on unemployment persistence as well as on macroeconomic and cyclical adjustment:

$$u_t = b_0 + b_{11} u_{t-1} + b_{12} (u_{t-1} F_t) + b_{21} \Delta \pi_t + b_{22} (\Delta \pi_t F_t) + b_{31} \Delta v_t + b_{32} (\Delta v_t F_t) + b_4 F_t + \eta_t \quad (2')$$

with flexibility reducing unemployment ($b_4 < 0$) and persistence ($b_{12} < 0$) and smoothing cyclical (ity) ($b_{21} < 0$ and $b_{22} > 0$) and adjustment ($b_{31} < 0$ and $b_{32} > 0$).⁹

Despite the fact that the Keynesian and NAIRU explanations of unemployment have significant ontological differences (i.e., in the way they understand the nature of unemployment), they share a similar epistemology, in that they both provide a macroeconomic framework for the analysis of unemployment. Empirically this implies that the two approaches can be tested simultaneously within an econometric model that nests models (1') and (2'). We can write this model as:

$$u_t = c_0 + c_1 u_{t-1} + c_2 (u_{t-1} F_t) + c_3 \Delta k_t + c_4 (\Delta k_t F_t) + c_5 \Delta \pi_t + c_6 (\Delta \pi_t F_t) + c_7 \Delta v_t + c_8 (\Delta v_t F_t) + c_9 F_t + \xi_t \quad (3)$$

Equation (3) is a merger between the two competing theories of unemployment and formally applies to dynamics operating within closed national economies, with no interactions across units of observation. Intuitively, however, there is no reason to expect that either of the proposed mechanisms should not apply in the case of open economies and in particular of regional economies within a single country. In a regional setting capital and labour mobility are additional equilibrating factors but both labour market frictions and the rate of accumulation (as well as macroeconomic shocks and unanticipated price movements) remain unambiguously a large part of the unemployment story.¹⁰

In the UK this is even more so the case, as the country exhibits very high degrees of unemployment persistence, both over time and in terms of regional unemployment differentials. A number of studies have shown

⁹ The role of flexibility on unemployment adjustment is not very well elaborated in the empirical macroeconomic literature. For example, Blanchard and Wolfers (2000) state that flexibility should reduce the adverse effect on unemployment of negative shocks. Under the assumption of symmetry, however, this implies that flexibility also weakens the beneficial effect of positive shocks. From a theoretical viewpoint, flexibility should soften the impact of adverse shocks but its impact in the case of positive shocks is ambiguous (either intensifying or weakening the impact of positive shocks).

¹⁰ Further, of course, the closed economy assumption has little validity also in the case of the OECD countries and especially the countries of the Eurozone, where much of the macroeconomic literature has focused, applying different versions of equation (3). The inconsistency is less notable at the regional level, where balance-of-payments constraints on employment growth do not apply (see Davidson, 1994).

that, although cross-regional linkages exist, they run short of achieving regional convergence (Hart, 1990; Chapman, 1991; McCormick, 1997; and others). Rather, regional differences in unemployment rates appear to be an equilibrium condition (Gray, 2004), with the implication that persistent unemployment differentials are due to regional differences in economic and institutional structures (Martin, 1997; McCormick, 1997).¹¹ Moreover, the UK regions appear to follow largely the same business cycle (Martin, 1997). Although this ‘cyclical synchronicity’ is not sufficient to explain region-specific unemployment evolutions (Chapman, 1991; Buyers, 1991), it suggests that the UK regions are largely subject to common (symmetric) shocks.

In a macroeconomic setting, these observations regarding the regional economies of the UK can be reflected in the following empirical formulation:

$$u_{i,t} = \alpha_i + \beta_t + du_{i,t-1} + \psi_{i,t} \quad (4)$$

where α_i proxies for fixed regional (economic and institutional) differences, β_t controls for common (national) unemployment fluctuations, and the temporal lag of log unemployment ($u_{i,t-1}$) reflects the observation about the significant unemployment persistence in the UK regions; while i and t index regions and time, respectively, to account for the panel formulation of the model.

In the empirical analysis that follows we use equation (4) as the reference model, allowing no influence on unemployment from the NAIRU and Keynesian variables. We then extend the model to include these influences, but restricting the coefficients on flexibility to zero. Thus, we estimate

$$u_{i,t} = \alpha_i + \beta_t + d_1 u_{i,t-1} + d_2 \Delta k_{i,t} + d_3 \Delta \pi_{i,t} + d_4 \Delta v_{i,t} + \xi_{i,t} \quad (4')$$

Following, we amend the estimating model to include direct and interaction effects from flexibility, as in equation (3), while we later also

¹¹ Among such structural characteristics, the literature identifies technological and skills mismatches (Hart, 1990), demand hysteresis (Buyers, 1991), elements of the wage setting process (Blanchard and Oswald, 1994) and labour supply deficiencies (Blackaby and Murphy, 1995; Beatty et al., 2000).

replace the flexibility indicator with the disaggregate measures that capture the elements of internal numerical, internal functional, external numerical, and external functional flexibility. Thus, our final estimating relationship becomes

$$\begin{aligned}
u_{i,t} = & m_1 u_{i,t-1} + m_2 (u_{i,t-1} \sum_{\kappa} \rho_{1,\kappa} F_{i,t,\kappa}) + m_3 \Delta k_{i,t} + m_4 (\Delta k_{i,t} \sum_{\kappa} \rho_{2,\kappa} F_{i,t,\kappa}) \\
& + m_5 \Delta \pi_{i,t} + m_6 (\Delta \pi_{i,t} \sum_{\kappa} \rho_{3,\kappa} F_{i,t,\kappa}) + m_7 \Delta v_{i,t} + m_8 (\Delta v_{i,t} \sum_{\kappa} \rho_{4,\kappa} F_{i,t,\kappa}) \\
& + m_9 \sum_{\kappa} \rho_{5,\kappa} F_{i,t,\kappa} + m_{10} \sum_{\kappa, \lambda} \rho_{6,\kappa, \lambda} (F_{i,t,\kappa} F_{i,t,\lambda}) + \alpha_i + \beta_t + \xi_{i,t}
\end{aligned} \quad (4'')$$

where κ and λ index the flexibility indicators, \mathbf{F} is now a vector of the four disaggregate indicators of flexibility, and the term for m_{10} represents the set of interactions between pairs of the flexibility indicators with $\kappa \neq \lambda$.

Some final theoretical considerations can be made about the relationship between flexibility and unemployment. Although in the preceding discussion the direction of causation runs from flexibility to unemployment, it is also true that unemployment can exert an impact on flexibility through a number of channels. First, from a demand-side, high levels of unemployment representing slack labour markets (low labour demand) imply reduced pressures for non-standard forms of labour use. Inversely, in tight labour markets (high pressure of demand) employers have to resolve increasingly to temporary or part-time employment and increased working hours. Thus, episodes of high unemployment should lead to relative declines in flexible labour use resulting in an inverse relationship between the two aggregates. On the other hand, from a supply-side rationale unemployment could be positively related to flexibility. With high unemployment the bargaining power of the labour force is weakened and thus employees are more willing to accept non-standard employment contracts and are more conducive to greater duration and intensity of work (i.e., overtime and functional flexibility). In the empirical analysis that follows we do not explicitly consider this direction of causation but rather focus on the macroeconomic impact that flexible labour use has on unemployment, accounting however for the possible endogeneity of flexibility in the estimating relationships.

4. Empirical analysis

(i) Macroeconomic determinants

The empirical analysis uses the twelve Standard Statistical Regions (SSRs) of the UK as the spatial unit and covers a period of 20 years (1985-2004), for which data on flexibility were possible to construct.¹² As stated above, we start with an exploratory regression (equation 4) in order to evaluate the significance of the temporal and regional fixed effects and the degree of unemployment persistence. The first two columns of Table 1 present the results from this equation (the first column restricts the persistence coefficient to zero while the second column presents the unrestricted model). As expected, temporal and regional effects are very significant, confirming the view that both regional structures and national cycle effects impact significantly on UK regional unemployment. In the unrestricted model the significance of the fixed effects –especially the regional– declines and the model returns a very strong persistence coefficient, which indicates that three quarters of regional log-unemployment at any time can be explained by unemployment in the previous period, even after controlling for national and regional effects.¹³ The apparent collinearity between the regional effects and the persistence coefficient seems to confirm the view that a large part of unemployment persistence in the UK is due to structural (fixed) regional characteristics, while the significance of the time effects verifies the very strong synchronicity of regional unemployment rates in the country.

¹² The use of administratively defined spatial units introduces a possible bias in the analysis, as these units do not necessarily correspond to the geography of sub-national labour markets in the country (e.g., travel-to-work areas). Besides limitations due to data availability, the use of SSRs is justified by the fact that the boundaries of sub-regional labour markets only rarely cross the administrative borders and thus aggregation at the regional level mainly implies loss of some degree of variation and much less so a significant aggregation bias. Still, we partly control for the possibility of aggregation bias with the use of regional fixed effects: to the extent that the patterns of cross-regional interactions are constant-over-time, the regional fixed effects correct entirely for this potential bias.

¹³ When the fixed effects are dropped the persistence coefficient is over 0.9 (0.92 without regional effects; 0.95 without any fixed effects) and unemployment persistence appears to explain alone as much as 85% of the variation of UK unemployment across regions and over time.

Table 1. Specification of the unemployment relationship

Dependent: ln(U)	(1)	(2)	(3)	(4)	(5)	(6)
Lag of log-U (persistence)		0.755* (11.84)	0.759* (14.90)	0.733* (12.15)	0.738* (14.80)	0.726* (14.86)
Productivity growth			-1.841* (-3.65)		-1.513* (-3.17)	
Change in inflation (lagged)			-0.654* (-3.70)		-0.526* (-3.10)	-0.474* (-2.67)
Capital growth (accumulation)				-3.061* (-5.31)	-2.507* (-4.49)	-2.086* (-3.71)
Positive productivity shock						-2.410* (-3.24)
Negative productivity shock						0.406 (0.92)
F-test for regional effects	81.86* <i>0.000</i>	2.24+ <i>0.014</i>				
F-test for time effects	136.40* <i>0.000</i>	48.77* <i>0.000</i>				
F-test for fixed effects	120.90* <i>0.000</i>	33.09* <i>0.000</i>	28.05* <i>0.000</i>	33.18* <i>0.000</i>	34.36* <i>0.000</i>	35.17* <i>0.000</i>
Observations	240	240	216	240	216	216
R-squared	0.928	0.966	0.972	0.970	0.975	0.976

Notes: #, + and * show significance at the 10%, 5% and 1% levels, respectively. Robust t-statistics are in parentheses; p-values in *Italics*. All regressions have been estimated with OLS using White's correction for heteroskedasticity.

The remaining columns of Table 1 report the results from a number of alternative specifications of equation (4'). Column 3 presents a simple NAIRU specification, where log-unemployment is made a function of lagged log-unemployment (proxying for structural unemployment), productivity growth (proxying for macroeconomic shocks) and the change in the rate of inflation.^{14,15} The NAIRU approach is supported by the results, with both productivity and inflation returning significant and negative signs. Column 4 tests a simple version of the Keynesian model, replacing the NAIRU variables with the rate of accumulation (capital growth).¹⁶ Again, the sign of the estimated coefficient is in line with theory and is highly significant. Moreover, accumulation remains a strong determinant of unemployment also in the next model, where we combine

¹⁴ The inflation variable has been calculated from data on regional prices collected from the Croner database (<http://www.croner.co.uk>). All other data come from the ONS (various sources).

¹⁵ We use the time lag of this variable to improve the performance of the estimations but also to account for the role of inflation expectations in shaping unemployment.

¹⁶ The capital growth variable has been calculated from data on regional gross fixed capital formation assuming a rate of depreciation of 5%.

the two theoretical mechanisms. All coefficients are highly significant and appear stable across the different specifications, but accumulation seems to be the strongest of the macroeconomic drivers of unemployment (in terms of standardised coefficients the effect of accumulation is three times larger than the productivity and inflation effects).

The last column of Table 1 examines an interesting extension of the earlier models, considering explicitly the case for positive and negative shocks producing asymmetric effects on unemployment. Positive productivity shocks, defined as episodes of productivity growth exceeding rates one standard deviation above the sample average, have a strong impact reducing unemployment, thus suggesting significant unemployment adjustments during upswings. In contrast, negative productivity shocks, similarly defined, do not appear to be as important in their impact on unemployment. Although the effect is positive (as expected), the estimate fails to be significant at conventional levels, highlighting another possible source of rigidity across the regional labour markets of the UK. Overall, the models corresponding to equation (4') explain as much as 98% of the variation of regional UK unemployment over the last twenty years. Comparing this with the result of the first column (restricted version of equation (4)) leads us to conclude that the structural variables in the model explain around 67% of the variability not explained by the temporal and regional fixed effects. Unemployment is found to exhibit strong persistence and to respond significantly to macroeconomic shocks (especially positive ones) and changes in the rate of inflation, but the main driver of unemployment appears to be the rate of accumulation.

(ii) The impact of flexibility

We now turn to the examination of the role of employment flexibility for unemployment and its impact on unemployment through its effects on persistence and adjustment to macroeconomic variables. Similar to the approach followed above, Table 2 presents the results from a

number of alternative specifications of equation (4''), where we restrict different coefficients to zero and we only include one aggregate indicator of employment flexibility (so that $\mathbf{x} = 1$ in the notation of equation (4'')).¹⁷ In column 1 we restrict all interaction terms to zero (i.e., $\mathbf{m}_2 = \mathbf{m}_4 = \mathbf{m}_6 = \mathbf{m}_8 = \mathbf{m}_{10} = 0$) and thus amend the last of the models in Table 1 with the aggregate flexibility term. The results for the structural variables are largely the same as before but, counter to expectations, flexibility returns a strongly positive coefficient. This clearly appears to refute the NAIRU approach to labour market flexibility and is very robust across different specifications of the model. When controlling for structural and macroeconomic regional differences, flexibility is associated to higher unemployment.¹⁸ A further exploration of the relationship between unemployment and flexibility is warranted.

In column 2 we explore further the impact of flexibility by relaxing the restriction on \mathbf{m}_2 thus allowing flexibility to impact on unemployment persistence. The coefficients on the structural variables are again very stable. Introducing the interaction effect reveals a very interesting finding. While the overall effect of flexibility on unemployment is positive (see Table A1 in Appendix for the estimated partial and total effects), in

¹⁷ In the regressions that follow we use the lag of the flexibility term, in order to account for the possible endogeneity of flexibility, as discussed in the previous sub-section. Further experimentation showed that the flexibility estimates are very robust to alternative specifications, including various IV formulations, where the flexibility indicator was made a function of a number of instruments, including lagged values of flexibility and unemployment as well as measures relating to regional structural characteristics (gender and industrial employment compositions, levels of education, unionisation).

¹⁸ In fact, it is only when we include time fixed effects *without regional controls* that flexibility returns a negative coefficient (results not shown but available upon request). A possible interpretation of this finding is that, keeping time (i.e., the national business cycle) constant, regions with flexible labour markets have lower levels of unemployment – but only due to some structural characteristic of these regions and not directly due to flexibility. As the later results show, this structural regional idiosyncrasy is mostly related to the impact of flexibility on regional unemployment persistence. An alternative explanation for the positive association between flexibility and unemployment is that higher levels of flexibility (especially internal flexibility elements) lower firms' external demand for labour thus reducing job creation and increasing unemployment. Relevant evidence for such a mechanism has been offered in studies that examine the efficiency effects of cost-saving strategies related to flexible labour use (Gallie et al., 1998; Arulampalam and Booth, 1998; Burchell et al., 1999; Michie and Sheehan, 2003), but this assertion is not supported by our later findings (first column of Table 3).

line with expectations the direct effect is negative. However, rather counter-intuitively, flexibility is found to significantly enhance unemployment persistence (see first row of Table A2).¹⁹ This finding has a very interesting implication as it suggests a degree of inherent rigidity in flexible labour markets. At the regional level where labour markets adjust at least partially through cross-regional movements (e.g., migration, wage spillovers, firm relocation), a reasonable interpretation of this finding is that flexibility reduces (the incentives to) cross-regional adjustment and thus leads to higher unemployment persistence within each regional economy (controlling for national business cycle effects).

Table 2. Flexibility effects on unemployment, persistence and adjustment

Dependent: ln(U)	(1)	(2)	(3)	(4)	(5)	(6)
Lag of log-U (persistence)	0.693* (13.81)	-0.149 (-0.49)	0.679* (13.26)	0.693* (13.76)	0.694* (13.75)	-0.189 (-0.59)
Change in inflation (lagged)	-0.501* (-2.95)	-0.543* (-3.16)	-0.487* (-2.93)	-0.550 (-0.38)	-0.493* (2.92)	-0.535 (-0.37)
Capital growth (accumulation)	-1.851* (-3.43)	-1.923* (-3.42)	-1.613* (-3.07)	-1.851* (-3.41)	-4.468# (-1.69)	-1.075 (-0.38)
Positive productivity shock	-2.186* (-3.08)	-1.912* (-2.81)	12.249# (1.78)	-2.188* (-3.09)	-2.079* (-2.94)	12.365# (1.89)
Negative productivity shock	0.428 (0.99)	0.531 (1.24)	-1.308 (-0.27)	0.427 (0.99)	0.451 (1.05)	-0.461 (-0.10)
Lag of flexibility	0.506* (2.76)	-1.800+ (-2.14)	0.449+ (2.52)	0.506* (2.74)	0.160 (0.41)	-1.845+ (-2.20)
Lag of flexibility *		1.025* (2.81)				1.057* (2.73)
Lag of log-U						
Lag of flexibility *			-17.997+ (-2.11)			-17.818+ (-2.17)
Positive shock						
Lag of flexibility *					2.943 (1.03)	-0.696 (-0.22)
Capital growth						
Flexibility * Change in inflation (lagged)				0.059 (0.04)		0.003 (0.00)
Lag of flexibility *			1.998 (0.37)			1.132 (0.21)
Negative shock						
F-test for fixed effects	33.31* <i>0.000</i>	30.21* <i>0.000</i>	30.36* <i>0.000</i>	32.82* <i>0.000</i>	32.06* <i>0.000</i>	27.49* <i>0.000</i>
Observations	216	216	216	216	216	216
R-squared	0.977	0.977	0.977	0.977	0.977	0.978

Notes: see notes in Table 1.

¹⁹ This finding implies that flexibility increases unemployment more the higher past unemployment is. It follows that flexibility is probably beneficial in periods and regions of low unemployment (less than 5.75% according to the estimates of column 2 in Table 2) but for high-unemployment regions/periods flexibility is not capable of reducing unemployment as its impact on strengthening unemployment persistence dominates.

Next we look at the impact of flexibility on unemployment adjustment to macroeconomic shocks. The results in column 3 are again stable and this time much more in line with economic intuition. As before, unemployment is found to adjust favourably to positive shocks and insignificantly to negative shocks. Flexibility appears to reinforce these adjustments (see Table A2), although the estimated effect in the latter case is also highly insignificant. Thus, while we could tentatively say that rigid labour markets seem to respond more favourably to negative shocks (generating less unemployment), statistically adjustment to negative productivity shocks is equally insignificant in flexible and rigid labour markets. On the other hand, favourable adjustments to positive shocks are observed in more flexible labour markets, while in very rigid labour markets (values below the sample minimum of flexibility) unemployment does not adjust at all to positive productivity shocks.

The role of flexibility to adjustment is further explored in column 4 of Table 2. Statistically, flexibility impacts adversely on the effect that accelerating inflation has on unemployment (i.e., in flexible labour markets unemployment is less responsive to changes in inflation), while accelerating inflation magnifies the (detrimental) effect of flexibility on unemployment.²⁰ In economic terms, however, these effects are very small: moving from the 10th to the 90th percentile of flexibility diminishes the negative effect of accelerating inflation on unemployment by around 0.08% while moving from disinflation to accelerating inflation enhances the unemployment effect of flexibility by 1.36% (see change in total effect for inflation in Table A.1). In economic terms the former represents a difference in the change in the unemployment rate for a 1% change in inflation of less than 0.002 percentage points, while for the latter, the difference in the change in unemployment for a 1% increase in flexibility is just over 0.001 percentage points.²¹

²⁰ Although the estimates on accelerating inflation have very low t-values, their joint significance is high (<1%) and thus their differences are also statistically significant.

²¹ To put it into perspective, this result implies that, for an initial unemployment rate of 5%, a 20% increase in flexibility will raise unemployment to 5.70% if inflation is

In column 5 we turn to the examination of the unemployment effects of flexibility in relation to capital growth. As was the case before, faster accumulation is related to lower rates of unemployment. The coefficient for the interaction term suggests that in flexible labour markets the impact of accumulation is smaller (alternatively, that flexibility results in higher unemployment the higher is the rate of accumulation). This result, read in conjunction with those derived for the change in inflation, implies that the role of accumulation is more important in rigid labour markets, while in their more flexible counterparts more important is price stability. More intuitively, the implication is that in a context of stagnating investment and price stability (like the current situation in much of the Eurozone), flexibility is more conducive to employment growth; while labour market rigidity appears more beneficial in economies with monetary and physical-capital expansion. In a sense, these two conclusions seem to be in line with the observed regularity, of Keynesian policies (e.g., to boost investment) being more relevant in rigid employment relations settings and monetarist policies (i.e., for price stability) suiting best more flexible labour markets. Nevertheless, further analysis shows that the estimated interaction effect for accumulation and flexibility is sensitive to the inclusion of the flexibility effect on persistence (interaction between flexibility and lagged unemployment). In the last column of Table 2, which presents the estimates for the full equation (4") (for $\kappa = 1$), the interaction of flexibility with accumulation returns a negative coefficient suggesting that, controlling for the effect of flexibility on unemployment persistence, accumulation reduces unemployment more in more flexible (rather than in more rigid) labour markets. This implies that the adverse effect of flexibility on the impact of accumulation is solely due to its effect on unemployment persistence.²²

accelerating and to 5.67% if inflation decelerates. Also, that if inflation increases by five points (say, from 2% to 7%) the corresponding unemployment rates for a flexible and a rigid labour market will be 4.80% and 4.79%.

²² Further analysis suggests that the impact of flexibility on the unemployment effect of accumulation is non-symmetric: controlling for the flexibility effect on unemployment persistence, flexible labour markets appear to be more conducive to smaller increases in

(iii) The role of the disaggregate elements of flexibility

Before concluding the empirical analysis it is important to report on the examination of the direct and indirect effects on unemployment of the disaggregate indicators of flexibility. That is, we relax the restriction $\mathbf{\kappa} = 1$ and estimate the full version of equation (4"). A summary of the obtained results is presented in Table 3.²³

As can be seen in the first column of Table 3, the estimates for the structural variables are not sensitive to the inclusion of the disaggregate indicators of flexibility. Unemployment persistence is still substantial, albeit somewhat smaller than before, while accumulation, changes in inflation, and productivity growth are all found to significantly reduce unemployment. Three out of the four flexibility indicators are positively associated to unemployment (as was the case for aggregate flexibility) but, interestingly, internal numerical flexibility appears to reduce unemployment, returning a statistically significant negative coefficient. Thus, labour-saving employment arrangements do not appear to be a cause of unemployment, counter to some findings in the literature (as discussed in footnote 18).

When the full interaction model is considered, the interpretation of the estimates on the structural variables changes. Here we are mainly concerned with the direct and interaction effects of the flexibility indicators. As is shown in column 2, in the full model the direct effect of all elements of flexibility is to reduce unemployment, as was the case with the aggregate indicator. The adverse impact on unemployment is for all elements of flexibility concentrated on their effect on unemployment

unemployment during slowdowns and to larger declines in unemployment during accumulation expansions (see Table A3 in Appendix).

²³ Table 3 deviates from the standard format and presents the regression coefficients in tabular form and without their associated t-statistics (instead, the last column reports the p-value for the joint significance of the linear and interaction terms of each of the variables). The first column reports on a version of equation (4") where $\mathbf{\kappa} = 4$ and $\mathbf{m}_2 = \mathbf{m}_4 = \mathbf{m}_6 = \mathbf{m}_8 = \mathbf{m}_{10} = 0$. The next five columns present the results for the full regression ($\mathbf{\kappa} = 4$, $\mathbf{m}_j \neq 0 \forall j$). The direct effect is depicted in the first column while the interaction effects for each of the flexibility indicators are presented in the successive columns.

persistence (see first row of Table 3). Concerning the impact of flexibility on adjustment to productivity shocks, the next two rows of Table 3 suggest that this is largely in line with the neoclassical expectations (as was the case in Table 2). However, the external numerical element exhibits a different behaviour. Hence, more extensive use of part-timing and temping appears to be associated to more moderate adjustments to positive shocks and stronger adjustments to negative shocks, thus in both cases leading to higher rates of unemployment, *ceteris paribus*.

Table 3. Types of flexibility and their effects on unemployment

Variable	No inter- actions	With interactions (full model)					F-test <i>p-value</i>
	Direct effect	Direct effect	Interaction with				
			Internal num/cal	External num/cal	Internal func/nal	External func/nal	
Lag of log-U (persistence)	0.659 (12.11)	-1.482	1.133	0.568	0.438	0.624	25.70 <i>0.000</i>
Positive shock of productivity	-2.116 (-4.02)	25.725	-25.818	7.113	-1.356	-14.599	4.87 <i>0.000</i>
Negative shock of productivity	0.548 (1.25)	-0.187	-5.096	13.502	-6.626	-2.015	1.16 <i>0.332</i>
Change in inflation (lagged)	-0.489 (-3.13)	0.437	-0.529	1.109	-0.185	-1.173	1.21 <i>0.306</i>
Capital growth (accumulation)	-1.217 (-2.39)	4.267	-9.470	2.639	-0.908	1.974	1.37 <i>0.239</i>
Lag of internal numerical flex/ty	-0.555 (-2.27)	-4.624	-	1.713	0.635	1.797	2.32 <i>0.018</i>
Lag of external numerical flex/ty	0.238 (1.58)	-1.213	-	-	-0.492	-1.983	2.88 <i>0.004</i>
Lag of internal functional flex/ty	0.187 (2.09)	-0.347	-	-	-	-0.757	1.66 <i>0.104</i>
Lag of external functional flex/ty	0.299 (1.96)	-0.844	-	-	-	-	3.57 <i>0.001</i>

Notes: Robust t-statistics (first column) and standard p-values (last column) in *Italics*. The F-test is a test for the joint significance of the linear and interaction terms of each of the variables. Estimation is with OLS using White's correction for heteroskedasticity. Fixed time and regional effects are included and are jointly significant. The overall fit of the regression is $R^2=0.978$.

Similarly, external numerical flexibility leads to a steeper Phillips curve, with unemployment declining by less during periods of monetary expansion where external numerical flexibility is high (although the implication of this is that during dis-inflationary periods external numerical flexibility helps contain unemployment). This disparity in the behaviour between external numerical flexibility and the other elements is

also observed in the case of the unemployment effects of capital growth. In contrast to the two internal elements of flexibility (as well as the aggregate indicator), higher levels of external flexibility (including this time also the functional element, i.e., self-employment) tend to reduce the beneficial effects of accumulation. Thus, it appears that the conclusion drawn earlier, in relation to flexibility's impact on the accumulation effect as estimated in the last column of Table 2, is driven mainly by the behaviour of the internal flexibility elements (especially the internal numerical).²⁴

The last part of Table 3 (last four rows) presents the individual (partial) impacts on unemployment of the interaction between various forms of flexibility. As can be seen, the combination of internal numerical flexibility with any of the other elements is detrimental, as it tends to raise unemployment. In contrast, all other combinations considered seem to contribute towards lower unemployment. Thus, *ceteris paribus*, combinations of external numerical flexibility with the functional elements as well as combinations of internal functional flexibility with the external elements appear to be beneficial with regards to employment.

5. Concluding remarks

Presented in this paper is an extensive analysis of the unemployment impact of some key macroeconomic factors and of employment flexibility in the UK regions over the period 1985-2004. A working definition of flexibility was adopted that focuses on the workings of the production process and, following the theoretical literature on the issue, differentiates between internal, external, numerical and functional aspects of flexible employment arrangements. The role of employment

²⁴ Allowing for asymmetric flexibility effects in the case of accelerating and stagnating investment produces somewhat different results. Internal numerical flexibility lowers the adverse effects of stagnation and enhances the positive effect of expansion, while external numerical flexibility has exactly the opposite effect (i.e., is always detrimental). In contrast, the effects of the two functional elements are symmetric (always reinforcing the accumulation effect): they are beneficial in cases of fast accumulation (further reducing unemployment) but they are detrimental in cases of stagnating accumulation (further increasing unemployment). See Table A3 in Appendix for a summary of these results.

flexibility was examined in relation to the key determinants of unemployment as identified by two competing explanations of unemployment, namely the NAIRU and Keynesian approaches.

For the NAIRU explanation flexibility helps reduce both the structural and cyclical elements of unemployment, by making the Phillips curve flatter and moving it to the left. For the Keynesian approach flexibility has a much more moderate role, influencing unemployment only through its effects on capital accumulation. At the regional level these macroeconomic explanations have only partial validity, as regions represent small open economies within a relatively closed (national) economic system and thus cross-regional adjustments play an important role in determining actual and equilibrium levels of unemployment. In the context of the UK regions, however, where such adjustments have been shown to be rather weak and unemployment differentials rather stable, the macroeconomic explanations are relevant, especially in explaining the part of unemployment that is net of fixed regional and temporal influences.

Given these observations, the focus of the empirical analysis was on the macroeconomic determinants of regional unemployment in the UK and on how the impact of these is affected by the observed levels and types of flexibility in the country. To that objective, the present study addressed three inter-related issues for the UK regions: the macroeconomics of the unemployment relationship; the unemployment impact of flexibility (quantity effect); and the unemployment impact of the composition of flexibility (quality effect). In particular, the following questions were asked. What is the main macroeconomic explanation of UK regional unemployment empirically? Is the NAIRU or a Keynesian explanation more relevant? What is the direct impact of flexibility and what other channels are there through which flexibility impacts on unemployment? Is the impact of the functional elements of flexibility uniform? What are the best combinations of flexible employment arrangements that minimise

(maximise) the detrimental (beneficial) effects of flexibility? The analysis produced a plethora of results, which are summarised below.

Productivity growth, monetary expansion (accelerating inflation) and capital growth (accumulation) significantly reduce unemployment. The accumulation effect is the strongest, and thus it appears that the Keynesian explanation of unemployment receives the firmer support from our data. This conclusion is further supported by the fact that employment flexibility (which is a NAIRU variable) is actually found to increase unemployment. A key finding in understanding this apparently counter-intuitive effect for flexibility is the estimate for a very robust adverse effect on unemployment persistence. The logical implication of this finding, given that a tendency for flexibility to facilitate (intra-)regional adjustments has indeed been found, is that flexibility tends to weaken inter-regional adjustments (cross-regional equalisation of unemployment rates) and that this effect dominates over the beneficial internal (within-regions) adjustment effect.²⁵ Controlling for its unemployment persistence effect, flexibility also appears to play an important role in relation to accumulation, again in consistence with the Keynesian view. A tendency for flexibility to reduce unemployment further under episodes of fast accumulation and increase unemployment by less in episodes of slow accumulation is found, although this tendency is indeed cancelled by the adverse unemployment effect through unemployment persistence, which dominates. Given this, it appears that flexibility is more appropriate in cases of monetary stability and slow accumulation, while labour market rigidity is preferable in more expansionary periods.

Based on these results, it appears that under-investment is a key macroeconomic explanation for the poor unemployment performance of some UK regions.²⁶ Given the high degree of unemployment persistence,

²⁵ Interestingly, this allows for the possibility that in cross-country analysis, where cross-sectional adjustment are already limited, flexibility can be found to have an overall beneficial effect with regards to unemployment.

²⁶ Under-investment in this context means investment that leads to slower capital accumulation and employment growth compared to population growth. The

which is apparently related to region-specific structural microeconomic characteristics and the weak role of cross-regional adjustments, in order to help improve economic performance in the more vulnerable areas (i.e., the north of England and the other countries of the UK) policy should seek to take measures that will support capital accumulation (both indigenous and inward investment) in these areas. This would appear to be more important than increasing the degree of flexibility in these labour markets, although some elements of flexibility would indeed make accumulation more effective in reducing unemployment.

The overall effect of three of these elements is to raise unemployment. While internal numerical flexibility appears robust in reducing unemployment, all other elements are associated, *ceteris paribus*, to higher unemployment rates. Nevertheless, as was the case with the aggregate index, the direct effect of all elements of employment flexibility is to reduce unemployment and thus the overall adverse effect is largely due to the fact that all elements robustly increase unemployment persistence. Among these elements, external numerical flexibility appears to be most harmful, as it plays an adverse role also with regards to adjustment to productivity shocks, monetary expansion and capital accumulation. All other elements and especially internal numerical flexibility have mostly beneficial effects. Critically, however, internal numerical flexibility appears less effective when combined with other elements of flexibility; instead, combinations of functional and of external elements appear beneficial (reducing unemployment, *ceteris paribus*). A simulation from the results of Table 3 suggests that internal numerical flexibility is most effective in lowering unemployment when it is the only significant flexible arrangement in the labour market – but when other elements of flexibility are widespread the internal numerical element is best to be minimised.

microeconomic mirror image of this is that migration is substantially below its market-clearing levels.

To conclude, the findings of the present analysis point to an important warning: flexibility is not a panacea for economic performance. Flexibility can have positive effects under some contexts, but it will almost certainly increase unemployment in some other contexts. The analysis of the UK regional economies suggests that flexibility is more likely to lower unemployment in economies where unemployment is already relatively low and which experience price stability and moderate rates of investment. Nevertheless, further research through similar within- and cross-country studies is clearly needed to confirm the robustness of these results in different contexts before firm policy recommendations can be drawn. Further research could also examine the role of spatial interactions among the regional or other economies under study, either formally or through the application of spatial econometric techniques. More importantly, it could seek to examine possible non-linearities in the relationship between flexibility and unemployment (beyond the simple log-linear form assumed here) and how these could be affecting the more detailed effects identified here. Above all, however, future research should attempt to shed light on the black box of the regional and temporal fixed effects that appear to play an important role in enhancing unemployment and unemployment persistence in the country. Presumably, these effects are related to a host of microeconomic factors, including employment compositions, participation rates, geo-demographic conditions (urbanism), production structures (specialisations, firm-sizes), education and skill levels, openness to trade, and the like. In the absence of such analyses, however, a policy implication clearly emerges from the present study: to effectively target unemployment, policy should look at other areas of possible intervention beyond the realm of enhancing labour market flexibility.

APPENDIX

Table A1. Estimated partial and total unemployment elasticity of flexibility, by interaction parameter (based on columns 2-5 of Table 2)

Impact of flexibility	Percentile values of structural variables					Change of effect (%)
	10%	25%	50%	75%	90%	
Direct effect	-1.800	-1.800	-1.800	-1.800	-1.800	-
Effect via persistence	1.402	1.729	2.105	2.350	2.617	86.62
Total effect	-0.398	-0.071	0.305	0.550	0.817	n/a
Direct effect	0.449	0.449	0.449	0.449	0.449	-
Effect via adjustment (+ve)	-0.466	-0.513	-0.587	-0.714	-0.891	91.04
Total effect	-0.017	-0.064	-0.138	-0.265	-0.442	2503.72
Effect via adjustment (-ve)	0.054	0.058	0.069	0.078	0.085	58.01
Total effect	0.503	0.507	0.518	0.527	0.534	6.20
Direct effect	0.506	0.506	0.506	0.506	0.506	-
Effect via inflation changes	-0.003	-0.001	0.000	0.001	0.003	n/a
Total effect	0.503	0.505	0.506	0.507	0.509	1.36
Direct effect	0.160	0.160	0.160	0.160	0.160	-
Effect via accumulation	0.210	0.243	0.288	0.469	0.594	182.93
Total effect	0.370	0.403	0.448	0.629	0.754	103.84

Note: The direct effects are taken directly from columns 2-5 of Table 2 (estimated coefficients for flexibility). The interaction effects are the product between the estimated interaction coefficients of Table 2 and the corresponding percentile values of the distribution of the structural variables. Thus, the table reads as follows: the estimated direct effect of flexibility on log-unemployment, according to the results of the regression examining the impact of flexibility on unemployment persistence (column 2 of Table 2), is -1.800 (first row in this Table); the effect via unemployment persistence (interaction between flexibility and lagged unemployment) is estimated to be 1.402 for cases where lagged unemployment takes values close to the 10th percentile of this variable's distribution; the same effect reaches a value of 2.617 for cases with lagged unemployment close to the 90th percentile of the distribution of lagged unemployment. As the last column shows, this represents a change in the estimated interaction effect, when moving from the 10th to the 90th percentile, of around 86.62%. The total effect is the sum of the direct and interaction effects.

Table A2. Estimated total unemployment elasticity for the structural variables (based on column 6 of Table 2)

Variable	Percentile value of flexibility					Change of effect (%)
	10%	25%	50%	75%	90%	
Persistence	0.652	0.679	0.722	0.756	0.792	21.63
Adjustment (+ve shocks)	-1.801	-2.234	-2.911	-3.527	-4.145	130.14
Adjustment (-ve shocks)	0.440	0.467	0.510	0.549	0.588	33.89
Changes in inflation	-0.532	-0.532	-0.532	-0.532	-0.532	-0.08
Accumulation	-1.629	-1.647	-1.675	-1.697	-1.722	5.70

Note: The table reads as follows: a 1% increase in lag-unemployment will lead to a 0.652% increase in current unemployment in a region with flexibility levels close to the 10th percentile of the distribution of flexibility and to a 0.792% increase in current employment in a region with flexibility levels close to the 90th percentile. This represents a 21.63% change in the estimated total effect as we move from the 10th to the 90th percentile of the flexibility distribution.

Table A3. Interaction effects of flexibility and episodes of accelerating and decelerating investment

Measure of flexibility	Measure of accumulation		
	Continuous	Positive shocks	Negative shocks
Production function	(-)	(-)	(-)
Internal numerical	(-)	(-)	(-)
External numerical	(+)	(+)	(+)
Internal functional	(-)	(-)	(+)
External functional	(+)	(-)	(+)

Note: The sign of the interaction effect (first column) is further decomposed into an accelerating-investment effect and a decelerating-investment effect. Stability in the signs (across rows, e.g., in the case of internal numerical flexibility) reflects asymmetry in the underlying effects. For example, negative signs show that flexibility reduces unemployment further in the presence of accumulation (positive shocks) and increases unemployment by less in the presence of negative shocks (the opposite holds for the interpretation of positive signs, e.g., in the case of external numerical flexibility).

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