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Developing an Index of Labour Market Adaptability for the UK

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Developing an Index of Labour Market Adaptability for the UK

BY
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LONDON SCHOOL OF ECONOMICS

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Employment Market Analysis and Research (EMAR) is a multi-disciplinary team of economists, social researchers and statisticians based in the Employment Relations Directorate of the Department for Business, Enterprise and Regulatory Reform.

Our role is to provide the evidence base for good policy making in employment relations, labour market and equality and discrimination at work. We do this through:

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- Commissioning external research reports
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- Assessing the regulatory impact of new employment laws
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About this publication

The project manager for this report was David Tinsley, Head of the Economics and Statistics Unit in the EMAR branch.

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Foreword

The Department for Business, Enterprise and Regulatory Reform (BERR) leads work to create the conditions for business success through competitive and flexible markets that create value for businesses, consumers and employees. It drives regulatory reform, and works across Government and with the regions to raise levels of UK productivity. It is also be responsible for promoting choice and quality for consumers through competition policy and for ensuring an improved quality of life for employees.

The Department places considerable importance on maintaining a competitive and flexible labour market. An adaptable labour market assists in sustaining high levels of employment, and helps create the conditions for business success in the UK.

As part of its ongoing research programme, EMAR have commissioned a range of work exploring labour market flexibility issues. This report forms a part of that programme. It discusses the development of a preliminary Index of Labour Market Adaptability for the United Kingdom. The Index is intended to provide an assessment of the degree of labour market flexibility and its development over time, along with the ability to identify the key drivers of those changes.

We propose to update the Index annually and publish it, alongside other indicators of labour market flexibility, in an annual report on UK labour market flexibility. The first report is scheduled to be published in spring 2008. We believe it will provide a valuable addition to the existing measures available to assess flexibility, and will be an important input into the Department's Public Service Agreement assessments.

We hope you find the report of interest. Electronic copies of this and other reports in our Employment Relations Research Series can be downloaded from the BERR website, and printed copies ordered either online, by phone or email. A full list of our research series is located at the end of this report.

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Grant Fitzner

Director, Employment Market Analysis and Research

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Executive summary

The paper develops an Index of Labour Market Adaptability (ILMA) for the United Kingdom for the period 1992 to 2005. The preliminary Index presented in this report takes an outcome-orientated approach to measuring flexibility, focussing on the extent that characteristics related to flexibility are present.

The Index is divided into three broad 'domains' of flexibility: production, labour cost and supply. Under each of these domains indicators are identified and the sub-indices and overall Index are built up.

About this report

The paper develops an Index of Labour Market Adaptability (ILMA) for the United Kingdom. It presents a number of different formulations of the Index, corresponding to different aggregation procedures and whether the index is cyclically adjusted or not. Overall these approaches do not appear to make a substantial difference to the broad trends the ILMA displays.

Medium-term trends in the ILMA suggest that labour market flexibility was increasing between 1992 and 2000. Since 2001 there appears to have been some stabilisation in the level of UK labour market flexibility.

A sensitivity analysis confirms the Index is fairly robust to the potential inclusion or exclusion of different underlying measures. The broad trends displayed by the ILMA are also consistent with other available assessments of flexibility.

About the authors

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1

Introduction

The Government places considerable importance on maintaining a competitive and flexible labour market. An adaptable labour market assists in sustaining high levels of employment, and helps create the conditions for business success in the UK.

The ongoing importance the Government puts on labour market flexibility is highlighted in its inclusion as a target in the Department's Public Sector Agreement 10 (PSA 10) for the 2005 to 2008 Comprehensive Spending Review period. The target, agreed between the then DTI and the UK Treasury in 2004, tasks the Department with 'maintaining or improving labour market flexibility' It has also been included in the new Business Environment PSA, for the 2008-2010 CSR period (see HMG 2007).

In order to monitor progress towards meeting this target it was considered necessary to develop a new indicator of labour market flexibility, one which was broad in nature and which sought to measure change over time.

This report set outs the development of such a measure – an 'Index of Labour Market Adaptability'. The ILMA seeks to provide a summary measure of the extent and development over time, incorporating the key characteristics of a flexible and adaptable labour market.

The rest of the paper is organized as follows. Section 2 discusses at greater length some of the conceptual issues that arise when thinking about labour market flexibility. The following section then considers the different elements that comprise our approach to labour market flexibility and discusses the empirical issues relating to the quantification of these elements into cardinal indexes. Section 4 examines the evolution over time of the constructed indexes. Section 5 discusses the sensitivity of the index to the inclusion of other variables, and contrasts its findings with other approaches. The last section offers some concluding remarks.

2

Concepts of flexibility

A clear conceptual definition of labour market flexibility is required before any attempt to develop a measure of it. At the broadest level, one possible definition might be the degree to which the 'forces' of demand and supply determine labour market outcomes without being impinged on by other factors, such as institutional, cultural and political impediments. However substantial further work would be required to operationalise such an approach. Another, perhaps more narrow, definition would be the extent and duration that unemployment deviates from its natural rate in response to shocks. At a conceptual level, all definitions are likely to be ultimately related, though the implications for how flexibility may best be measured are likely to vary.

For the purpose of defining conceptually what 'flexibility' means in our work, we prefer a fairly broad definition. We define flexibility as the ability of labour market outcomes to adapt over time and in response to shocks. This definition allows for the fact that labour market flexibility and adaptability may be exhibited across a range of labour market outcomes, and is not overly prescriptive about the nature of the adaptation.

In terms of developing a measure of flexibility, which necessitates a frequently updatable time-series and is conditioned on data availability, we focus on the extent to which a range of employment arrangements which *a priori* may be correlated with flexibility are apparent in the labour market.

A significant body of labour market research considers labour market flexibility as being an integral factor in driving its theoretical and empirical results. Despite this, there is a comparable lack of research that attempts to identify and measure the forms that flexibility may take more precisely. Work by the OECD and other international bodies, such as the ILO and the European Foundation, represent the most significant attempts in this area.

However, even here measures tend not to have well developed time-series, and often have problems of comparability between the different periods over which they are measured. The OECD measures have been used and expanded in several academic studies (Nickel, 1997; Blanchard and Wolfers, 2000; Nickel and Nunziata, 2001) and are probably the most internationally and inter-temporally comparable measures.

Despite these previous efforts, two important deficiencies largely remain. First, most existing indicators refer to cross-country comparisons in the relative strictness of labour market institutions. But overall labour market flexibility depends on more factors than simply just the institutional environment. Quantifying the role of institutions is important, but is short of revealing the extent and quality of flexible arrangements that prevail in each labour market. A second problem with institution-based measures of flexibility is that they

exhibit limited variation over time and assume similar fundamentals across countries. In contrast to institutions, prevailing levels (and types) of flexibility may exhibit more year-to-year variation. In any case, the 'institutions' approach to measuring flexibility suffers from a disproportionate emphasis on just one of the pillars that determine the extent and type of (in)flexibilities that are observed in any given labour market.

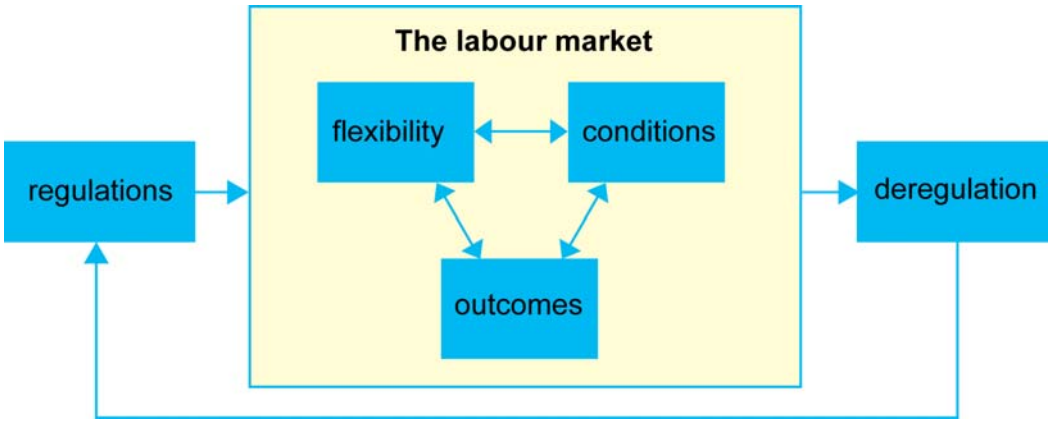
It is worthwhile elaborating on the first deficiency of institution-based measures of flexibility. Assuming that flexibility increases each time labour market regulation occurs, or conversely that flexibility decreases every time there is some deregulation, ignores the fact that flexibility is determined by numerous other factors aside from employment regulation or labour market or institutions (Pollert, 1991; Solow, 1998; Monastiriotis, 2006a).

In fact, several forms of labour market regulation may exist in order to correct inflexibilities that might otherwise exist. For example, a minimum wage may address monopsony power in the labour market (Manning, 2003). Pre-existing rigidities in the labour market means that the regulatory environment is not a sufficient statistic to gauge the degree of labour market flexibility alone. Labour market flexibility can increase or decrease for reasons completely unrelated to regulations or institutions.

Reflecting these considerations, our preferred approach to thinking about flexibility is that it is an outcome of numerous factors acting in the labour market, rather than just being dominated by one. In this context, flexibility is best viewed as an outcome rather than a potential or, in other words, in terms of effective rather than theoretical flexibility.

The figure below, taken from Monastiriotis (2006b), illustrates the dynamic interaction between labour market outcomes, regulation, and flexibility. Regulation can be thought of a set of conditions that are outside the labour market but impact upon it. Labour market outcomes, such as the level of employment and real wages, will be a function of these regulatory conditions, other conditions such as the skill-mix and geographical dispersion, and also the degree of flexibility in the labour market. In turn, labour market outcomes will have feedbacks onto the regulatory stance, other conditions (which may move with some inertia) and the level of flexibility. In this sense, flexibility is itself an outcome, from a complex set of interrelationships.

Figure 1. Regulation, deregulation, flexibility, and the labour market



Of course the ‘outcome’ of flexibility then remains to be measured, as this is still an unobservable concept. In order to move to observables we can examine what characteristics usually associated with flexibility we can observe in the labour market. This is the perspective that has been employed for the construction of the Index of Labour Market Adaptability.

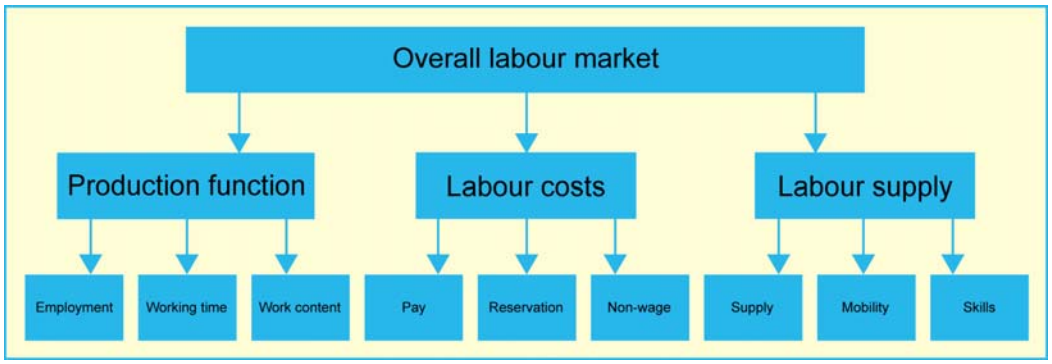
3

Operationalising flexibility for the ILMA

We therefore interpret labour market flexibility as an endogenous outcome of a set of inter-relationships acting in the labour (and indeed product) market. In order to move from this definition to measuring the degree of flexibility present in the labour market and how it has developed over time, we need to identify and categorise the labour market characteristics that we would normally expect to be representative of flexible outcomes.

For the purposes of the construction of the ILMA we define labour market flexibility according to three broad domains: 'production function flexibility', 'labour costs flexibility' and 'supply-side flexibility', as illustrated in Figure 2. Each of the three broad domains has three sub-domains covering more specific flexible components.

Figure 2. Identified components of flexibility



The three domains and their component sub-domains, identified in Figure 2, are by no means the only labour market characteristics likely to affect overall adaptability or flexibility. There is some scope for extension. Nonetheless, we believe they capture most of the main drivers.

Production function

The first sub-domain of production function flexible characteristics or components consists of employment arrangements that allow firms to take on workers without necessarily committing to a permanent long-term employment relationship with them. Elements in this category may include temporary employment, including fixed-term and seasonal work. Other characteristics here might also include part-time work, home-working, sub-contracting and outsourcing. All of these characteristics allow the firm, to differing degrees,

some flexibility in allocating work and managing its internal production processes.

A second sub-domain of flexible characteristics, closely related to the first, has been described by the ILO as 'working-time flexibility' (Osaki, 1999). These characteristics will reflect the ability of firms to adjust the hours of their workers. They may include the degree of overtime, flexible working, shift-working, weekend working and the extent of regulations covering working-time.

A third group of flexible labour arrangements relates to how work is allocated, or the content of work. These would include arrangements on multi- tasking, team- working and within job occupational mobility, which offer employers greater functional flexibility.

Labour costs

The flexibility of pay and other labour costs represent another important domain contributing to overall labour market flexibility. This flexibility has a number of different aspects. Real wage flexibility may be summarised in part by the elasticity of wages with respect to unemployment, i.e. how much real wages respond to disequilibria in the labour market. Minimum wages and the level of the reservation wage may be important in determining the level of nominal (and real) wage flexibility.

The structure of wage bargaining and union power (including the coverage of the union movement and the degree of centralisation in the wage bargaining) will also influence the extent of pay or wage flexibility. The size of non-wage labour costs, such as payroll taxes and pension contributions, will affect the distance between the production and consumption wage (known as the 'tax wedge'). Research shows that this also impacts on overall wage flexibility.

Labour supply

The third domain of flexible labour characteristics relate to the flexibility of the supply of labour, both in terms of head-count or quantity and also in terms of its 'quality'. The elements covered here may include the extent of formal and job-related training, qualifications, literacy and skills. More skilled workers are more likely to innovate, and better able to adopt new technologies and processes.

Supply flexibility may also include various measures of labour mobility, such as the propensity of workers to move across occupations, sectors and regions. Mobility is strongly affected by factors outside the labour market, such as housing costs and transport infrastructure.

Possible candidate measures

Thus, production-function flexibility includes 'flexibility in employment', 'flexibility in working time' and 'flexibility in work content'. Correspondingly, labour-cost flexibility includes 'flexibility in non-wage costs', '(average) pay flexibility' and 'flexibility in the determination of reservation wages'. Finally,

supply-side flexibility can be split into 'labour supply flexibility', 'flexibility in skills acquisition' and 'mobility'.

In constructing the ILMA we identified a number of possible candidate measures for inclusion under each of the sub-domains of flexibility. Table 1 below sets out some of these candidates:

Table 1. Candidate measures of labour market flexibility by domain

PRODUCTION FUNCTION	LABOUR COSTS	LABOUR SUPPLY
Flexible employment	Pay flexibility	Labour supply
Part-time employment	Real wage flexibility	Inactivity rates
Fixed task contracts	Responsiveness to economic shocks	Pension-age employment
Temporary employment	Centralisation / coordination / coverage of wage bargaining	Early retirements
Fixed-term contracts	Union density	Labour mobility
Seasonal employment		Regional
Irregular / occasional work		Sectoral
Home-working	Reservation wages	Occupational
Sub-contracting	Nominal wage rigidity	Job mobility
Outsourcing	Unemployment benefits (duration – coverage)	Length of tenure
	Minimum wages (coverage / ratio)	Job-related relocation
Working-time flexibility	Non-wage labour costs	Skills acquisition
Flexible working hours	Payroll taxes ('wedge')	Job-related training
Shift-work		On-the-job training
Weekend-work	Employers' contributions (pensions, healthcare, etc)	Government-provided training (ALMPs)
Use of overtime	Cost element of H&S and other labour standards	Apprentice placements
Annualisation of working hours		Return-to-schooling / re-qualifications
(Paid) leave and holidays breaks		
Work content / labour standards		
Multi-tasking		
Team-working		
Broadened job definitions		
Within-job mobility		

Having identified possible candidates measures, we look for data in order to measure them. Our criteria for a data source suitable for inclusion in the ILMA is that there is a reasonable length of time-series information for that variable, from a good quality data source that has broad coverage (across the UK and industries etc).

Table 2 below indicates variables that have been used in the present construction of the ILMA and the data sources from which they are drawn. More details on definitions and sources can be found at Annex C.

Table 2. List of flexibility indicators included in the preliminary Index

PRODUCTION FUNCTION (PF)		LABOUR SUPPLY (LS)		LABOUR COST (LC)	
	Source:		*Source:*		*Source:*
Flexible employment (FE)		Labour mobility (MOB)		Pay flexibility (PAY)	
Extent of part-time working	LFS	Sectoral mobility	LFS	Real wage elasticity	Estimated
Reasons for part-time working	LFS	Occupational mobility	LFS	Union density	LFS, BERR
Extent of temporary working	LFS	Regional mobility	LFS		
Reasons for temporary working	LFS	Job tenure	LFS		
Home working	LFS				
Self-employment	LFS				
Working time flexibility (WT)		Flexibility in the supply of labour (SUP)		Flexibility in reservation wages (RES)	
Attitude to working longer hours	LFS	Flow into activity over the year	LFS	Replacement rate	OECD
Variability of weekly hours	LFS				
Extent of overtime working	LFS			Nominal wage rigidity Indicator	Nickel & Quintini
Extent of unpaid overtime working	LFS				
Extent of shift-work working	LFS				
Extent of weekend working	LFS				
Work content flexibility (WC)		Flexibility in skills acquisition (SKI)		Flexibility in non-wage labour costs	
Within-firm job mobility	LFS	Offer of training by current employer	LFS	-	
		Employer financing of trainng	LFS		

Our measures of production flexibility include measures of the variability of hours, overtime hours (both paid and unpaid), shift-work, weekend working, part-time employment, whether part-time working is voluntary, temporary employment, whether temporary employment is voluntary, within firm occupational changes, a measure of home working and self-employment. Variables are usually calculated as a percentage of their respective populations. So, for example, we calculate the share of employment that is part-time and the share of employees that work shifts, etc. Data for this domain is drawn from the Labour Force Survey (LFS). The LFS, being an established survey from the Office for National Statistics with a fairly long time series, is an attractive source of data for the ILMA.

The measures included in the labour supply sub-domains are also derived from the LFS. They include measures of industrial, occupation and regional mobility, job tenure, on the job training and its financing, and the flow out of inactivity.

The measures included in the labour cost flexibility sub-domains are drawn from a broader range of sources. In order to provide an indicator of real wage

flexibility we estimate a real wage elasticity, which we allow to vary over time. We also include a measure of nominal wage rigidity from a paper by Nickell and Quintini (2003). Data from the OECD provides a measure of the replacement ratio to capture 'reservation wage' flexibility. Finally, we include the BERR measure of union density, which is drawn from the LFS.

4

Issues in the construction of the indexes

The production of the ILMA forms a multi-layer process. First we produce measures of the various observable elements of flexibility under each sub-domain as outlined in Table 2 in Section 3. Then we aggregate these elemental measures into their respective sub-domains, and then further into their 'domains'. The last layer is the aggregate ILMA, which reflects the average level of flexibility/adaptability in the UK labour market.

The process of aggregation into the sub-domains, domains and final ILMA raises a number of important issues that we consider below.

Sectoral and other adjustments

It is likely that labour market flexibility varies across sectors and occupations. There is therefore a question as to whether one should control for changes in composition. The methodology we employ in constructing the ILMA makes such adjustments possible, but for the purposes of the current exercise we do not make these controls. This reflects a number of considerations. First, this exercise covers a relatively short time frame, while compositional changes are typically slow (they are more pronounced across economies than within economies over time). And, second, we are interested in labour market adaptability whatever its source, so that we consider that an increase in flexibility that arises because of a change in composition should still result in a rise in the ILMA.

Aggregation and weighting

To aggregate the information we collect from the base indicators into the sub-domains and domains, we have to make sure that we 'compare like with like'. For example, how do you add the degree of part-time working with the degree of overtime being worked? One approach would be to see how far each variable differs from either an 'optimal' level or by using some external information. For example, we could look at the degree our base indicators differ from US or EU-15 variables. But this is not possible in the present exercise, partly due to time constraints largely due to the lack of comparable data available in other countries.

We therefore use an alternative approach in which we reference the base indicators to some endogenous values. The approach taken uses a method of aggregation which we find to be appealing both functionally and intellectually. All base-indicators are standardised by the product of their mean value with its inverse, ie $\mu*(1-\mu)$. This is equivalent to standardising by the mean, but also

takes into account the fact that our base-indicators are (almost always) top- and bottom-censored (i.e., they range between 0 and 100) and that, by implication, they follow an S-shaped rather than a linear path. Using any version of a mean-standardisation makes the base-indicators directly comparable (and thus possible to aggregate) but by using the mean*inverse_mean standardisation we can account for the fact that, for any given variable, an increase from, say, 90% to 95% represents a more significant increase (in an economic sense) than one from 40% to 45%. In our favoured approach we then apply a linear scale transformation on the standardised variables before aggregating into sub-domains; we also present some variations on this approach.

Once we have our standardised sub-domains, there is then the question of how to aggregate these in order to produce the overall domains and the final ILMA. The implicit weighting structure here is not trivial: for example, is working time flexibility more or less important than wage flexibility?

Given the lack of any prior knowledge or theoretical justification for assuming one particular weighting structure, we use equal weights for the aggregation of sub-domain indicators into domains and into the aggregate ILMA. There is of course an implicit weighting scheme underlying the domains, as after the standardisation of the base variables described above each base-indicator received an equal weight in its contribution to the aggregate value for the sub-domain to which it belonged. The resulting sub-domain indicators are then aggregated into domains, again assuming equal weights for the contribution of sub-domains to the value of the domain to which they belonged. Effectively, this means that we apply smaller weights to base-indicators that belong to sub-domains for which more information was available. The theoretical justification for this is that aggregate flexibility is equally determined by flexibility in three main domains (production function, labour costs and labour supply) and that the aggregate index should be independent of variations across (sub) domains in the number of relevant indicators that we could identify and/or measure[1].

[1] An alternative method of index construction would be to apply a principal components analysis (PCA). This has the appealing feature of 'letting the data speak' (and it is perhaps less influenced by the researcher), but importantly has a number of disadvantages. First, it produces endogenous weights that are not independent of the sample and thus are not consistent over time. In other words, when updating the ILMA in subsequent years, PCA will produce a (slightly) different set of factor loadings, thus changing the values of the ILMA for all years. By implication, each subsequent update of the ILMA would also imply a complete revision of all values of the ILMA across the time-period covered. Second, it returns a number of components that do not necessarily have any economic interpretation. The variables are grouped together on the basis of how well they correlate with each other and not on any meaningful economic basis. For example, it could be that (for whatever reason) part-time employment and wage flexibility are collinear; but it is difficult to conceptualise to which theoretical aspect of labour market flexibility the combination of these two variables would fall. Instead, our approach has the advantage of producing sub-indexes that are directly related to theoretical conceptualisations of flexibility and, crucially, to domains of flexibility that correspond clearly to distinct areas of policy intervention.

Business cycle adjustments

Since we view flexibility as a response to, among others, labour market conditions, we expect that it will show some cyclical behaviour. To some extent we could make an argument here similar to that for sectoral composition, i.e. that we are interested in flexibility regardless of source, and therefore we should not control for it. But any changes in flexibility that arise from cyclical issues will not be trended, unlike compositional effects, while we would not want our assessment of the change in the level of adaptability of the labour market to be biased by the position of the economic cycle. We therefore produce versions of the ILMA in which we control for the influence of the business cycle.

The approach to adjusting for cyclicality is based on modelling the base flexibility indicators as AR(1) processes with a time trend. Regressions of the form:

$$Y_t=\mu+ß_1Y_{t-1}+ ß_2t+ ß_3U_t$$

were estimated. Where Y_t is the base indicator (part-time share, variability of hours etc), t is a time trend and U is the unemployment rate. The regression model that we used allowed for only a contemporaneous effect of unemployment but we felt this was sufficient given the rather high unemployment persistence in the UK. The inclusion of a time-lag of the dependent variable and a time-trend was done in order to deal with problems arising from serial correlation in the regression residuals, since (most of) the variables are time-trended. This specification also made sense intuitively, as we would normally expect that flexibility is a non-stationary variable.

Table 3. Estimates of the impact of unemployment on the base-indicators

Dependent variable	Coefficient on unemployment b	t-statistic	R-squared	Dependent variable	Coefficient on unemployment b	t-statistic	R-squared
PF_WT1	-0.07	2.94**	0.98	PF_WC1	0.13	3.48***	0.93
PF_WT2	-0.002	0.06	0.80	LC_PAY1	-0.32	1.57	0.71
PF_WT3	-0.02	1.76*	0.90	LC_PAY2	-0.015	0.77	0.98
PF_WT4	0.061	3.54***	0.95	LC_RES1	-0.013	1.21	0.88
PF_WT5	0.029	2.99**	0.82	LC_RES2	-0.31	0.49	0.30
PF_WT6	-0.033	1.53	0.80	LS_MOB1	-0.044	1.03	0.77
PF_FE1	0.0001	0.01	0.86	LS_MOB2	0.20	2.59**	0.72
PF_FE2	0.063	2.44**	0.97	LS_MOB3	-0.11	3.45***	0.78
PF_FE3	-0.024	0.59	0.89	LS_MOB4	-0.0006	0.018	0.59
PF_FE4	0.064	2.52**	0.98	LS_SKI1	-0.034	2.59**	0.97
PF_FE5	0.040	1.42	0.96	LS_SKI2	0.16	2.74**	0.60
PF_FE6	0.035	3.35***	0.92	LS_SUP1	0.088	2.32**	0.73

Notes: Absolute value of t-statistics. *, ** and *** show significance at 10%, 5% and 1%, respectively. The first two letters of the variables show the corresponding domain (PF: production-function; LC: labour costs; LS: labour supply); the letters following the underscore show the corresponding sub-domain (Working Time; Flexible Employment; Working Conditions; PAY flexibility; REServation wages; MOBility; SKIlls acquisition; and SUPply of labour). The detailed list of base-indicators is given in Annex B.

A summary of the results for these regressions is presented in Table 3. In the majority of cases we find evidence of an unemployment effect that is statistically and economically significant. To avoid being too rigid with our adjustments we decided not to adjust by unemployment only in cases where the t-statistic of the unemployment coefficient was below 1.2 in absolute values.

Having estimated regressions of the form above, the cyclically adjusted measures are then calculated by subtracting from the actual series the part of its value that can be explained by unemployment. In other words, after performing our estimations we calculate:

$$Y_{adj}=Y_t-ß_3U_t$$

The adjusted base measures Y_{adj} are then used to calculate the sub-domains and domains in the same manner as discussed earlier in this section and set-out algebraically in Annex A.

5
Results

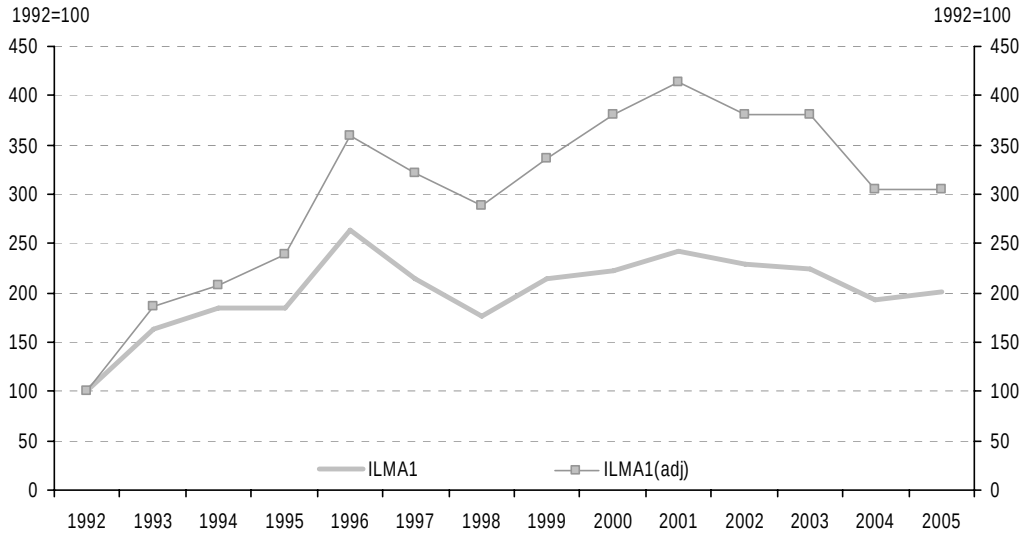
Having derived the elemental 'base' indicators in table 2 and then applied the standardization and aggregation procedures discussed in Section 3, we can calculate the underlying sub-domains and domains that make up the Index. The final stage is then to aggregate the domains into the overall ILMA.

Overall indices of labour market adaptability

We derive two 'pairs' of ILMAs, with each pair containing a cyclically adjusted ILMA and the unadjusted equivalent. The difference between each pair reflects a slightly different aggregation procedure, reflecting the stage in aggregation at which we apply a liner scale transformation on the data.

ILMA1 applies a linear scale transformation *after* aggregating the standardised base-indicators into sub-domains. This approach makes the sub-domain indicators somewhat less meaningful, as the base-indicators are not expressed at a percentage of their maximum range before adding. It does though have the advantage of making the domain indicators straightforwardly the outcome of a set of comparable constituent elements. ILMA1adj is the cyclically adjusted version of ILMA1.

Figure 3. Aggregate Index of Labour Market Adaptability, ILMA1

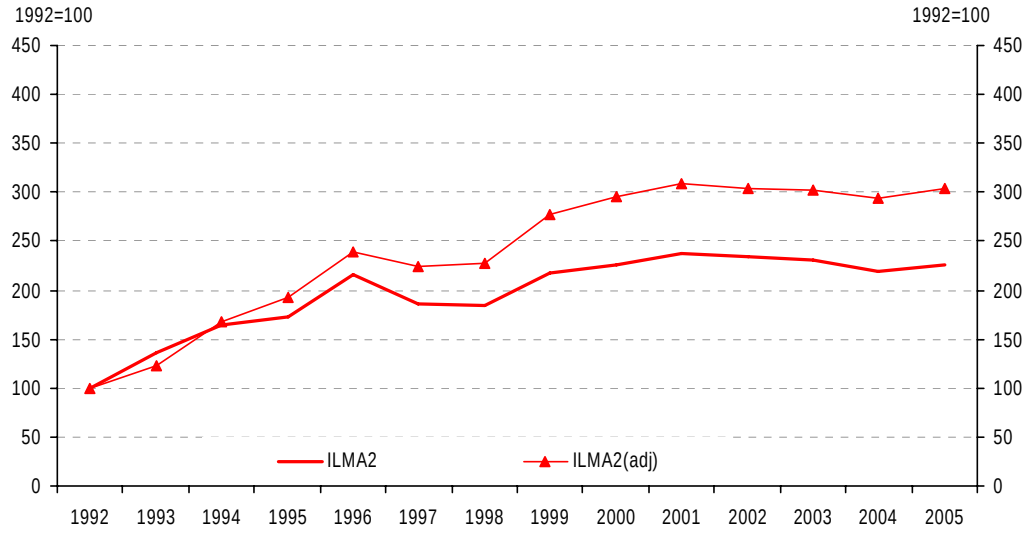


Source: BERR

ILMA2 applies the linear scale transformation at the initial base-indicator level, directly after the standardisation by mean but *before* the aggregation into sub-domains. This has the advantage that all indicators are expressed as a percentage of their maximum range from the start. ILMA2adj is then the cyclically adjusted version of ILMA2.

Our preferred indices are ILMA2 and ILMA2adj, as these aggregate the base indicators in the most intuitively appealing level manner, but we calculate ILMA1 and ILMA1adj for completeness and to analyse the sensitivity of the ILMA to different aggregation approaches.[2]

Figure 4. Aggregate Index of Labour Market Adaptability, ILMA2



Source: BERR

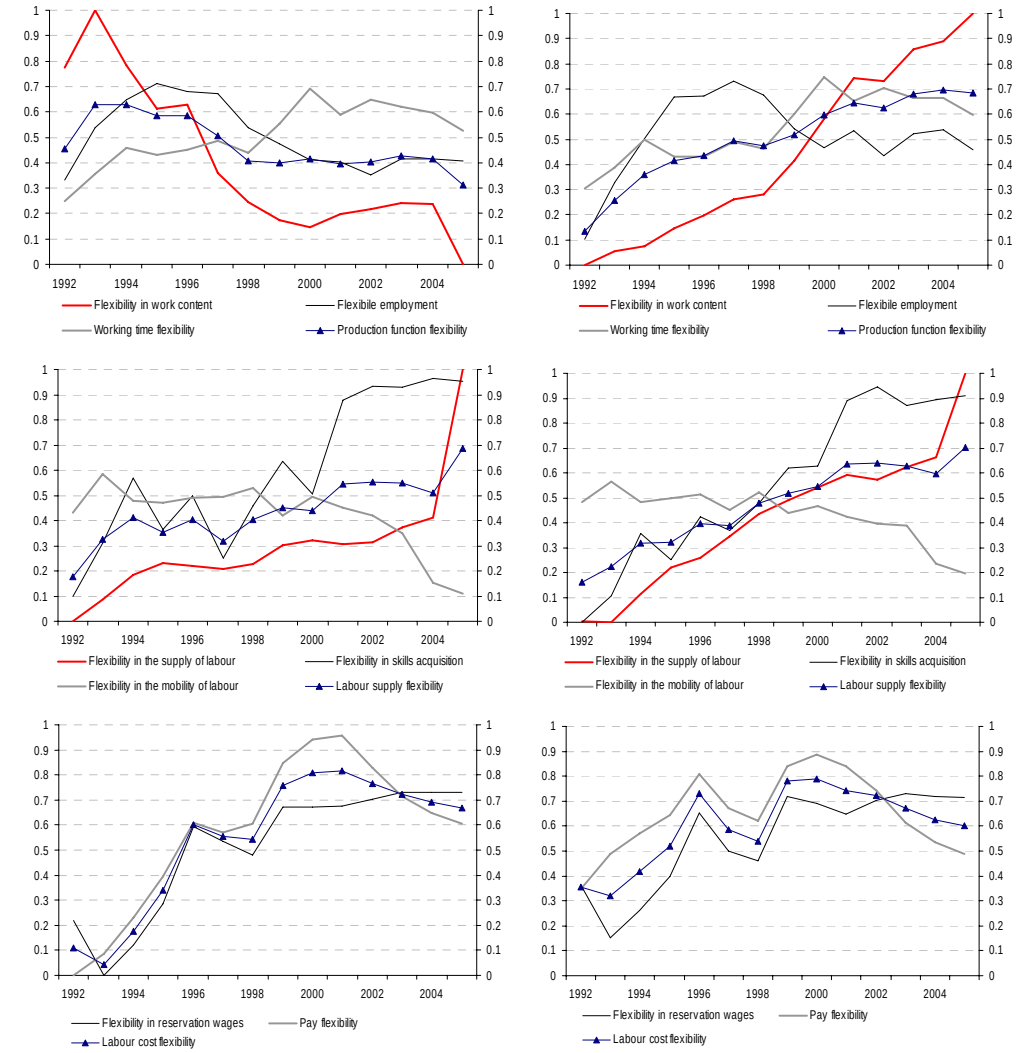
Looking at Figures 3 and 4, it is evident that all four versions of the aggregate Index of Labour Market Adaptability point to the same broad picture between 1992 and 2005. They all show that flexibility has increased since 1992, with most of the increase having occurred in the early-to-mid 1990s. Subsequently, the indices present a slower rise until around 2000 or 2001, followed by a relative stabilisation.

The unemployment-adjusted indicators show the largest increases immediately post-1997, while the ILMA2-type indicators show lower declines post-2002. But the overall behaviour of the final index is not significantly altered in any of the ILMA versions. Our preferred indices, ILMA2 and ILMA2adj, indicate that flexibility has increased since 1996 and looks to have stabilised at historically high levels.[3]

[2] A time series for each of the four aggregate measures can be found at Annex D.

[3] Since unemployment adjustment seemed to exert little, if any, influence on the resulting ILMAs, we considered alternatively applying the unemployment adjustment procedure at higher levels of aggregation, i.e., at the sub-domain and domain indicators instead of at the base-indicators. This made relatively little qualitative difference to the evolution of the derived indexes. Our preference is to cyclically adjust at the level of the base indicators, as this

Figure 5. Trends in ILMA2 domains and sub-domains, 1992-2005
(first column not cyclically adjusted, second column cyclically adjusted).



Source: BERR

The six panels in Figure 5 present the three main domains (from top to bottom: production function, labour costs and labour supply) both for the unadjusted ILMA2 (left) and unemployment-adjusted ILMA2adj series (right). As can be seen, in many cases the results are not very different between the adjusted and unadjusted series. The main exception to this is the sub-domain indicator measuring 'flexibility in work content' although this is perhaps due to the fact that for this sub-domain we had to rely on only one base-indicator, which is known to be very cyclical (Evans, 1999). Smaller differences – but, as should be expected, clearly identifiable ones – are observed for pay flexibility and labour mobility.

approach avoids imposing the assumption that the relative cyclical variation is the same across indicators (within each domain).

The graphs above show that all labour market flexibility sub-domains have risen since the early 1990s, with the exception of the un-adjusted series for production-function flexibility. Of the three (cyclically adjusted) sub-domains:

- production function flexibility rose steadily through most of the period
- labour supply flexibility saw a sharp increase over the period
- labour cost flexibility rose during the 1990s but has dipped somewhat in recent years.

The relative stabilisation in overall labour market flexibility since 2000 appears to have been influenced by similar trends across all three domains, with declining pay flexibility the most important contributor. However, when looking at the cyclically adjusted sub-domain indices, the decline appears to be attributable mainly to only a few indices, namely 'flexible employment' (part-timing, temping, etc), 'pay flexibility' (responsiveness of wages to unemployment) and 'labour mobility' (sectoral, occupational and regional). Pretty much all other elements, including 'skills acquisition', 'flexibility in the supply of labour' and flexibility in 'work-content' and 'working-time', have continued to rise, conditioning for unemployment, at least until 2004.

6

Sensitivity of the Index and comparisons to other measures

Sensitivity of the Index

The overall Index of Labour Market Adaptability is based upon 25 individual 'elemental' base labour market indicators. Each of these measures is included in a particular sub-domain of the Index because there are prior reasons for believing they are correlated with labour market flexibility. But it is worthwhile considering how sensitive the overall ILMA is to the inclusion or exclusion of particular elemental measures, as some of the measures chosen for inclusion in the ILMA may be less well correlated with labour market flexibility than others. Equally, there may exist measures that are correlated with flexibility that are not currently included in the ILMA.

In order to explore the sensitivity of the ILMA further we consider the case in which a new elemental measure is added to each of the sub-domains in turn. As most of the measures in the ILMA are proportions (such as the share of part-timers in employment) we draw the values for this new measure from a uniform [0, 1] distribution, randomly generating a new time-series for the new measure. The effect of including the randomly generated new measure on the overall ILMA is then calculated by following the aggregation procedure for ILMA2. We generate values for the new elemental measure repeatedly, so that we can build up a range over which the ILMA varies when a new elemental measure is added to each sub-domain.

The results from adding new randomly generated measures are illustrated in the charts in **Annex C**. Each chart shows the range over which the ILMA would vary on the inclusion of a new elemental measure in a given sub-domain.[4] The charts confirm the basic intuition that the sub-domains that are populated with more elemental measures have lower possible ranges, essentially because we are averaging over a greater number of measures. Conversely, those sub-domains such as the pay flexibility ones that tend to have less constituent elements have a wider possible range.

[4] It's worth noting that the ranges will not be symmetric around the existing values for the sub-domain. In the extreme, if the current value of the elemental variables are at their maximum, then inclusion of a new measure will have the effect of producing a new sub-domain value below the existing one – the range will therefore lie below the current values of the sub-domain.

Generally the analysis of the ranges over which the sub-domains may vary indicates that the overall index is robust to the inclusion of new measures. In fact choosing to add a randomly generated new measure is a fairly demanding test, as we would hope in practise that any new measure included would be correlated with overall flexibility and therefore the other measures, in which case the ranges would be considerably tighter.

Comparisons with other measures of flexibility

One of the primary reasons for developing an index of labour market adaptability is the lack of measures already available that follow similar conceptual and methodological strategies. As such, comparison of the ILMA to other measures is difficult. Nonetheless we can compare the ILMA to a number of other approaches to measuring labour market flexibility as guide to whether the ILMA movements since 1992 are broadly intuitive.

As discussed previously, measures of the strictness of employment protection legislation are a fairly narrow measure of one aspect of labour market flexibility. They also tend to suffer from a lack of long time-series available. Nevertheless, a measure of the strictness of employment protection legislation developed by the OECD, suggests that the UK labour market remained relatively constant in terms of the strictness of legislation between 1990 and 1998, before becoming somewhat stricter by 2003. The OECD measure therefore stands in some contrast to the findings of the ILMA, which suggest flexibility has improved since 1990. However it should be borne in mind that the OECD measure is narrower, focusing solely on employment law.

Table 4. Measures of the strictness of employment regulation

Measure	Summary index of employment protection legislation strictness	Rigidity of employment index
Source	OECD	World Bank
1990	0.599	
1998	0.599	
2003	0.745	13
2004		13
2005		14
2006		14

Source: OECD Employment Outlook 2004, World Bank 'Doing Business Report' series.

The OECD EPL relies on three main measures related to the protection of 'regular' workers against individual dismissal, specific requirements for collective dismissals and regulation of temporary forms of employment. A rise in the EPL indicates an increase in the 'strictness' of employment legislation. The full range is 0-6.

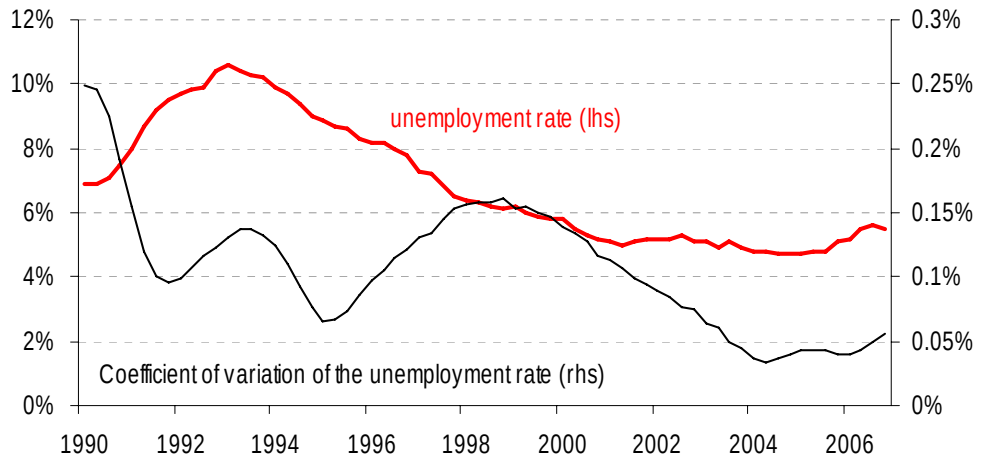
The World Bank's Rigidity of Employment Index is an average of three sub-indices: the difficulty of hiring a new workers, the difficulty of firing a worker and the rigidity of expanding or contracting the number of working hours. Higher values indicate more rigid restrictions.

The World Bank's annual *Doing Business* reports publish fairly similar measures of the strictness of employment regulation. These only cover the years from 2003, but indicate little change in the strictness of employment legislation since the series began. This measure therefore broadly supports the ILMA findings of a fairly static picture in flexibility since 2000.

At the other extreme to these fairly narrow gauges of labour market flexibility, another approach to assessing how UK labour market has developed is to consider labour market outcomes at a more aggregate level.

A more flexible labour market should in principle result in a high level of employment, as demand and supply are free to equilibrate. This should be reflected in a low level of unemployment. Equally, a flexible labour market should mean that demand shocks do not persist, so the deviations in unemployment from its 'natural rate' should be relatively short-lived.

Figure 6: Unemployment rate and its variance since 1990*

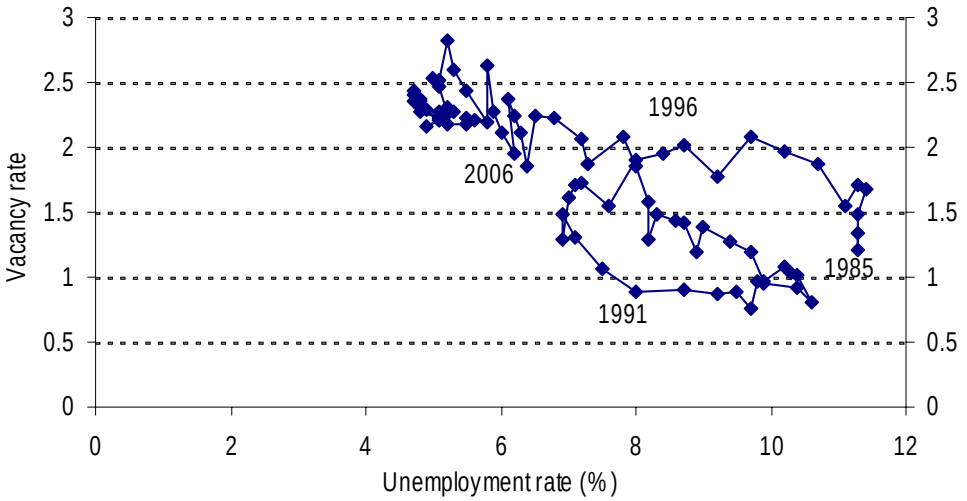


Source: ONS, BERR *The coefficient of variation is calculated over rolling 4-year periods.

Figure 6 plots the evolution of the unemployment rate since 1990 and also a rolling average of its coefficient of variation (the standard deviation divided by the mean). Both measures show a decline over the 1990s. The unemployment rate has been fairly low and stable since 2000, while the coefficient of variation continued to fall until 2004 before increasingly slightly. On this evidence the profile displayed by the ILMA of increasing flexibility over the 1990s and relative stability since 2000 looks plausible.

Another possible indication of the state of labour market flexibility concerns the relationship between vacancies and unemployment, known as the 'Beveridge curve'. A flexible labour market would be expected to match vacant jobs with people looking for work speedily and efficiently. In the Beveridge curve depicted in Figure 7 this would be indicated by any given unemployment rate being associated with a lower vacancy rate. Movements towards the origin could then be characterised as increasing flexibility. On this basis, the level of labour market flexibility improved over the second half of the 1990s, after some apparent deterioration in the early part of the decade.

Figure 7. Vacancy against unemployment rate



Source: ONS data, BERR calculations

Overall, analysis of the sensitivity of the ILMA indicates that it is fairly robust to the inclusion of potential new measures. Further, although existing measures of flexibility that are comparable to the ILMA are scarce, those that do exist tend to support the broad profile of the ILMA – showing increasing labour market flexibility over the course of the 1990s before some more recent stabilisation.

7

Concluding remarks

Labour market adaptability is a key concern for the Government. A competitive and flexible labour market will help ensure the economy sustains a high level of employment is well placed to respond to the challenges of globalisation.

In order to monitor developments in labour market flexibility it is useful to be able to measure it. There are a number of different ways one can go about doing this, each with advantages and disadvantages. Frequently, the regulatory environment that the labour market operates within is 'measured' in some form, usually by surveys or ranking exercises. But employment regulations, though important, are by no means the only factor. A wide range of other factors such as labour supply, skills, wage and working time flexibility influence labour market adaptability.

The preliminary Index of Labour Market Adaptability developed in this report takes an outcome-orientated approach to measuring flexibility, focussing on the extent that characteristics that may reflect flexibility are present.

The Index is divided into three broad domains of flexibility – production, labour costs and supply – each with three sub-domains covering more specific flexible components. Specific indicators are identified for each of the nine sub-domains. From these, three sub-indices and an overall Index are built up.

Main findings

The paper develops an Index of Labour Market Adaptability (ILMA) for the United Kingdom, covering the period 1992 to 2005. It presents a number of different formulations of the Index, corresponding to different aggregation procedures and whether the index is cyclically adjusted or not. Overall these approaches do not appear to make a substantial difference to the broad trends the ILMA displays.

Medium-term trends in the ILMA suggest that labour market flexibility was increasing between 1992 and 2001. After 2001 there appears to have been some stabilisation in the level of labour market flexibility. The ILMA indicates that the UK labour market in 2005 was substantially more flexible that before 1997.

A sensitivity analysis confirms the Index is fairly robust to the potential inclusion or exclusion of different underlying measures. The broad trends displayed by the ILMA are also consistent with other available assessments of flexibility.

Next steps

We plan to further develop the ILMA in a number of ways. First, by extending the Index back into the 1980s, to allow for a comparison over a period when there was substantial labour market deregulation. Second, many of the indicators in the Index are capable of being broken down in some form at the regional level. This would allow us to explore the links between regional labour market performance and flexibility further.

Third, we will also consider whether other flexibility measures might merit inclusion. For example, the tax wedge, measures of functional flexibility, the availability of labour, and management-employee relations. Fourth, we will be producing a sub-index focused on aspects of flexibility strongly related to BERR's key policy areas (see HMG 2007: 5).

We propose to update the Index annually and publish it in an annual report, alongside other indicators of flexibility in the UK labour market. The first report is scheduled to be published in spring 2008. We believe it will provide a valuable addition to the existing measures available to assess flexibility, and will be an important input into the Department's Public Service Agreement assessments.

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Annex A: Calculation of indices

This annex sets out the algebraic calculation of the ILMA. We use ILMA2 as our example.

Let B_{it} be a base indicator (for example, the share of part-time working etc) under sub-domain S_j at time t. The standardised base indicator is defined as:

$$M_{it} = B_{it} / (\mu_b \cdot (1 - \mu_b))$$

where μ_b is the mean of B_{it}.

Sub-domain S_j, is defined as:

$$S_{jt} = \frac{1}{N_i} \sum (M_{it} - M_{i\min}) / (M_{i\max} - M_{i\min})$$

where N_i is the number of base indicators under this sub-domain.

The domain index D_k is then defined as:

$$D_{kt} = \frac{1}{3} * \sum S_{jt}$$

where k=1,2 or 3

The overall ILMA is then:

$$ILMA_t = \frac{1}{3} * \sum D_{kt}$$

Other versions of the ILMA follow a similar construction. Under ILMA1 the sub-domain S_{jt} is the mean of M_{it} and the standardisation by range occurs at the level of the domain D_{kt}.

The cyclically adjusted variants of the ILMA follow the same pattern. The base indicator B_{it} is then $B_{adjit}=B_{it}-ß_3U_t$.

Annex B:
Data sources used

Labour Force Survey variables

The table below sets out details on the variables used in the ILMA that are drawn from the Labour Force Survey.

Production function flexibility

Variable	Base indicator	LFS Variable	Description
WTF_1	Attitude to working longer hours	UNDEMP	Whether would work longer hours: % who answer 'no'. Average value= 91%.
WTF_2	Variability of weekly hours	VARHR	Whether weekly hours tend to vary: % who answer 'yes'. Average value = 41%.
WTF_3	Extent of overtime working	ACTPOT+ACTUOT	Average paid and unpaid overtime hours over average hours. Average value = 18%
WTF_4	Extent of unpaid overtime working	ACTPOT	Average unpaid overtime hours over total overtime hours. Average value = 49%.
WTF_5	Extent of shift-working	SHFTWK99	Shift work in main job: % who answer 'occasionally'. Average value = 3%
WTF_6	Extent of weekend working	EVSAT+EVSUN	Whether work weekends: % who answer yes to Saturday or Sunday or to both. Average value=44%.
FE_1	Extent of part-time working	FTPTWK	Whether works full or part-time: % who work part-times. Average value = 25%.
FE_2	Reasons for part-time working	YPTJOB	Reason for working part-time: % who answer 'could not find a part-time job'. Average value = 11%.
FE_3	Extent of temporary working	JOBTYP	Whether permanent or non-permanent: % who answer 'not permanent'. Average value = 7%.
FE_4	Reasons for temporary working	WHYTMP	Reason for temporary job: % who answer 'could not find a full-time job'. Average value = 35%.
WC_1	Within firm job mobility	OCC change, same firm	Number of people who are in a different occupation from last year but are still with the same firm over total occupation changes. Average value = 29%.
FE_5	Extent of home working	HOMED	Locations of work in reference week: % who answer at least one day a week working from home. Average value = 4%.
FE_6	Extent of self-employment	SELF	Employment status in main job: % who answer self-employed. Average value = 13%.

Labour supply

	Base indicator	LFS Variable	Description
LS_MOB1	Sectoral mobility	IND CHANGE	Number of people who work in a different industry to a year ago as a proportion of people who work for a different firm from a year ago. Average value = 71%.
LS_MOB2	Occupational mobility	OCC CHANGE	Number of people who work in a different occupation to a year ago as a proportion of people who work for a different firm from a year ago. Average value = 82%.
LS_MOB3	Regional mobility	REG CHANGE	Proportion of people changing region. Average value = 2.7%.
LS_MOB4	Job tenure	TENURE	Average job tenure. Average value = 5.8 yrs.
LS_SKI1	Training on the job	ED4WK	Proportion of people offered education or training by current employer. Average value = 28%.
LS_SKI2	Employer financing of training	TRNOPP	Employer financed training offered. Average value = 53%.
LS_SUP1	Flow into activity	Inactive flow	Proportion employed now but inactive a year ago. Average value = 3.7%

Other variables

Real wage elasticity

The real wage elasticity is econometrically estimated from a rolling regression of the form:

$$log(w_t)=a(1)+a(2)*log((pgdp(_{t-1})*gva(_{t-1}))/emp_{t-1}))+a(3)*U_{t-1}+a(4)*Z_{t-1}$$

Where w_t is the wage, measured by the Average Earnings Index; $pgdp_t$ is the GDP deflator; *GVA* is Gross Value Added; emp_t is employment, measured from the Labour Force Survey; U_t is the unemployment rate and Z_t are a number of other structural factors such as union density.

This equation is estimated over a 15-year rolling sample, starting in 1975. The coefficient *a(3)* is then the real wage elasticity.

Union density

Union density data is taken from DTI (2006).

Replacement rate

Taken from OECD Gross Replacement Rate data. The OECD summary measure is defined as the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment. For further details see OECD (1994) and Martin (1996).

Nominal wage rigidity indicator

Nominal wage indicator is taken from Nickell & Quintini (2003).

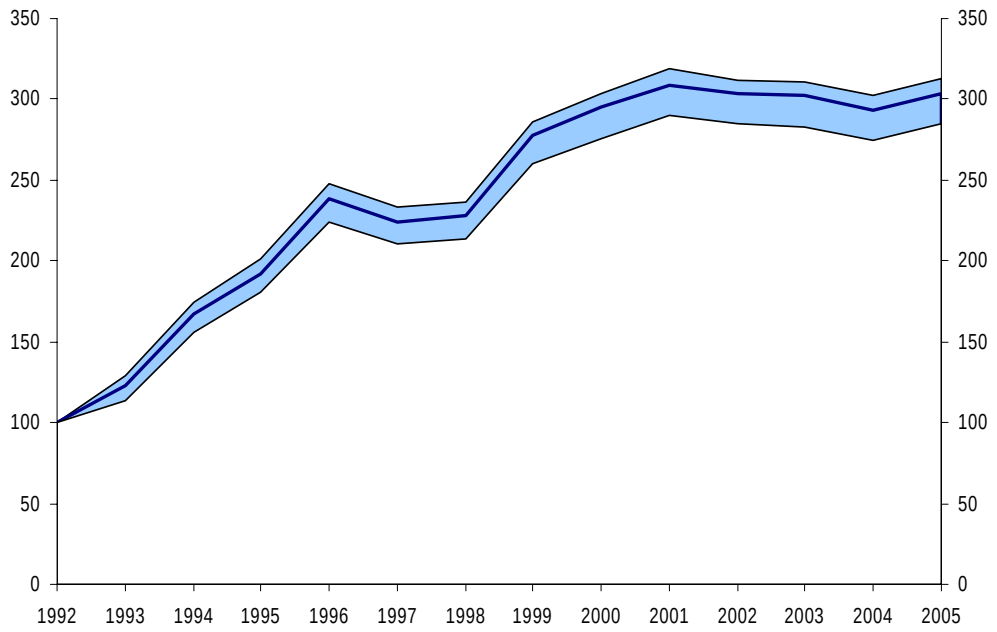
Annex C: Sensitivity analysis

In order to explore the sensitivity of the ILMA further we consider the case in which a new elemental measure is added to each of the sub-domains in turn. We draw the values for this new measure from a uniform [0, 1] distribution, randomly generating a new time-series for the new measure. The effect of including the randomly generated new measure on the overall ILMA is then calculated by following the aggregation procedure for ILMA2.

The results from adding new randomly generated measures are illustrated in the charts in below. The charts confirm the basic intuition that the sub-domains that are populated with more elemental measures have lower possible ranges.

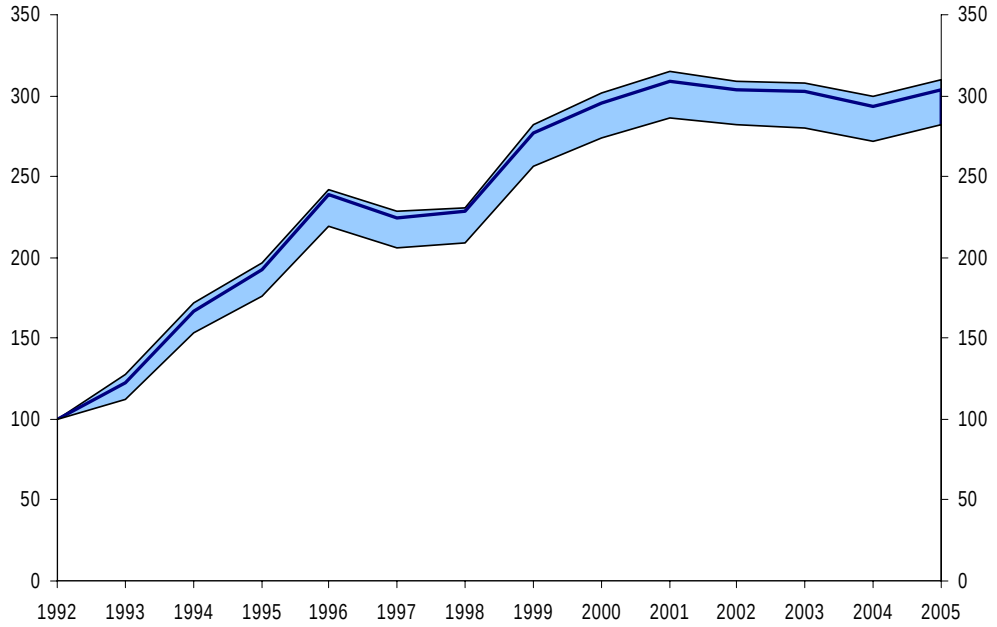
These ranges do not correspond to confidence intervals around the Index, as they do not consider the effects of the underlying uncertainty in the data on the Index. There is no reason for the ranges to be symmetric around the existing values for the sub-domain. In the extreme, if the current values of the elemental variables are at their maximum, then inclusion of a new measure will have the effect of producing a new sub-domain value below the existing one – the range will therefore lie below the current values of the sub-domain.

Figure C1. Variable added to sub-domain: Working time



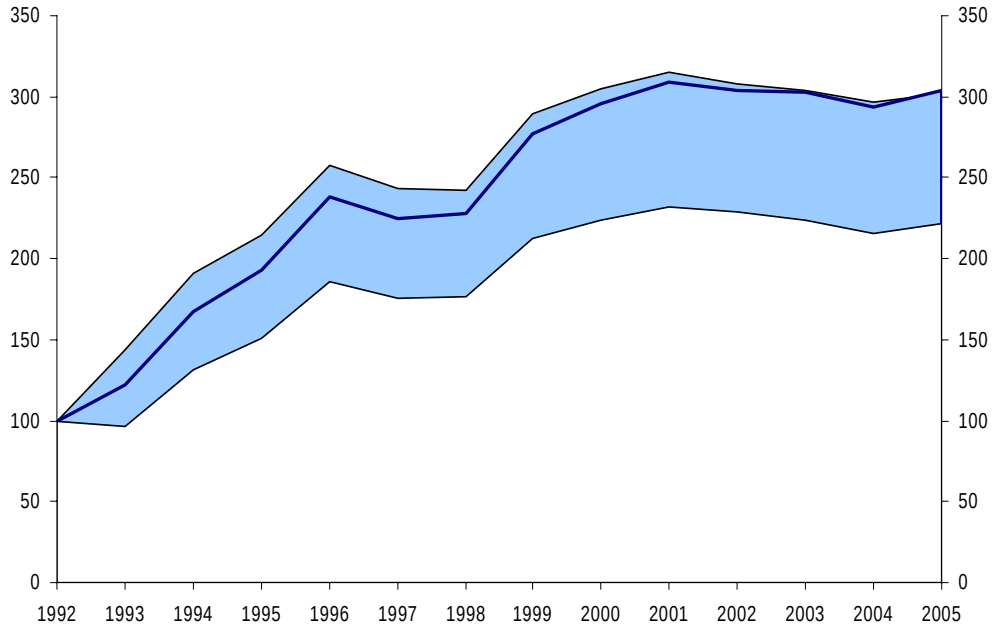
Source: BERR calculations

Figure C2. Variable added to sub-domain: Flexible employment



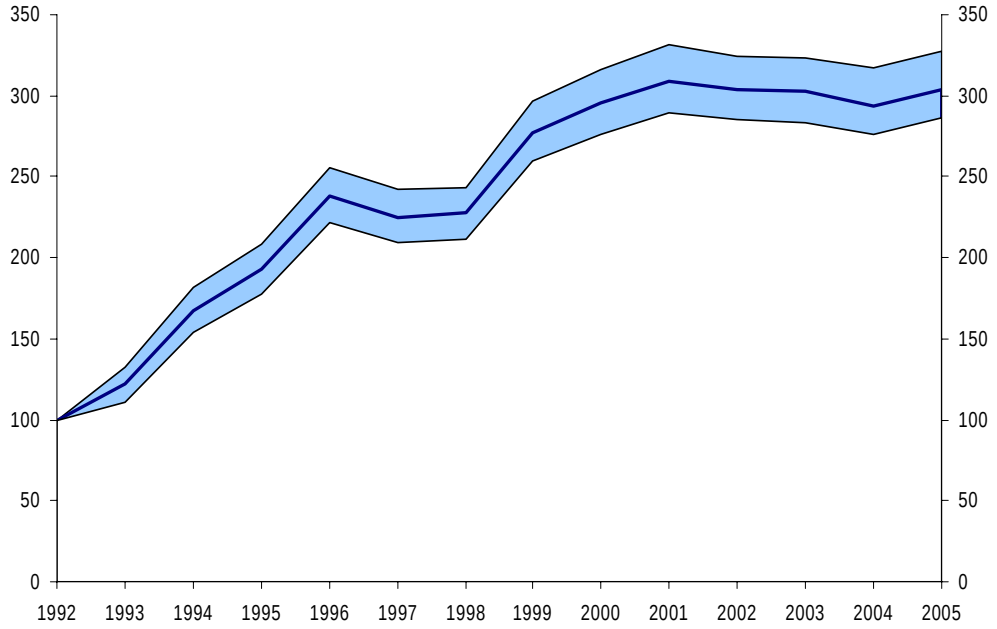
Source: BERR calculations

Figure C3. Variable added to sub-domain: Work content



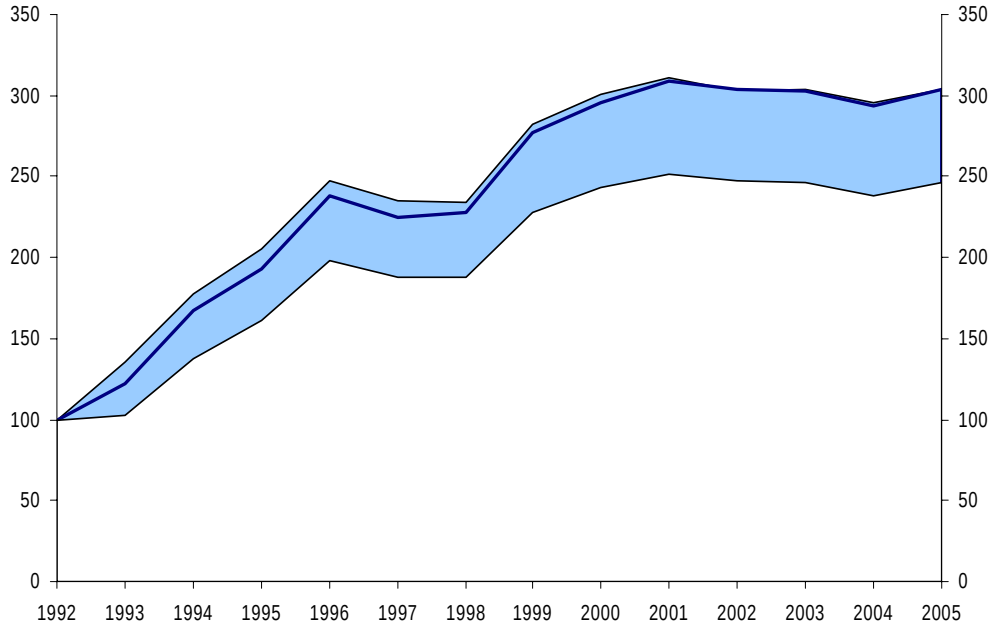
Source: BERR calculations

Figure C4. Variable added to sub-domain: Labour mobility



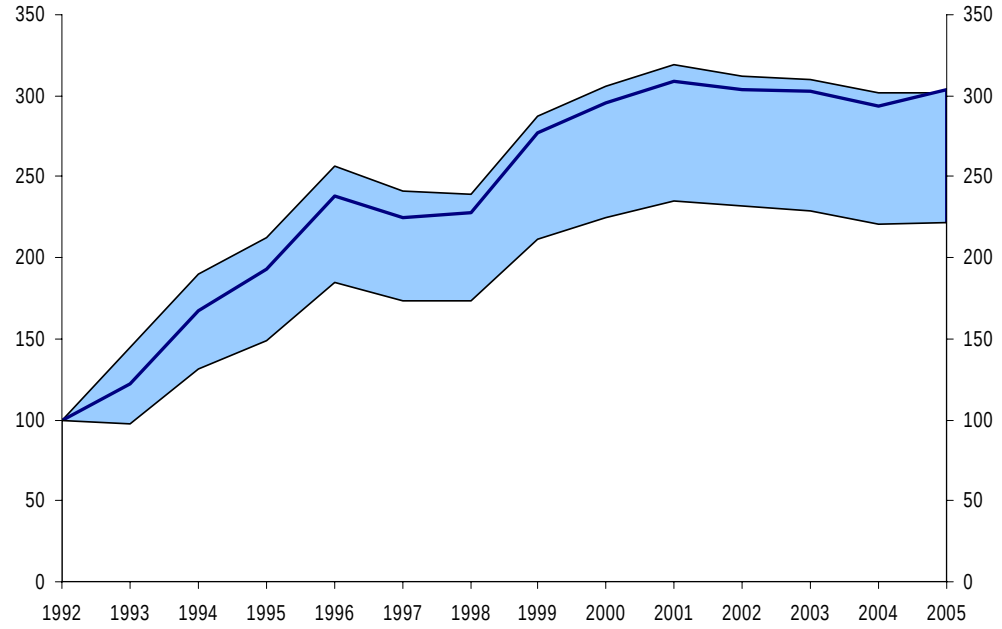
Source: BERR calculations

Figure C5. Variable added to sub-domain: Skills acquisition



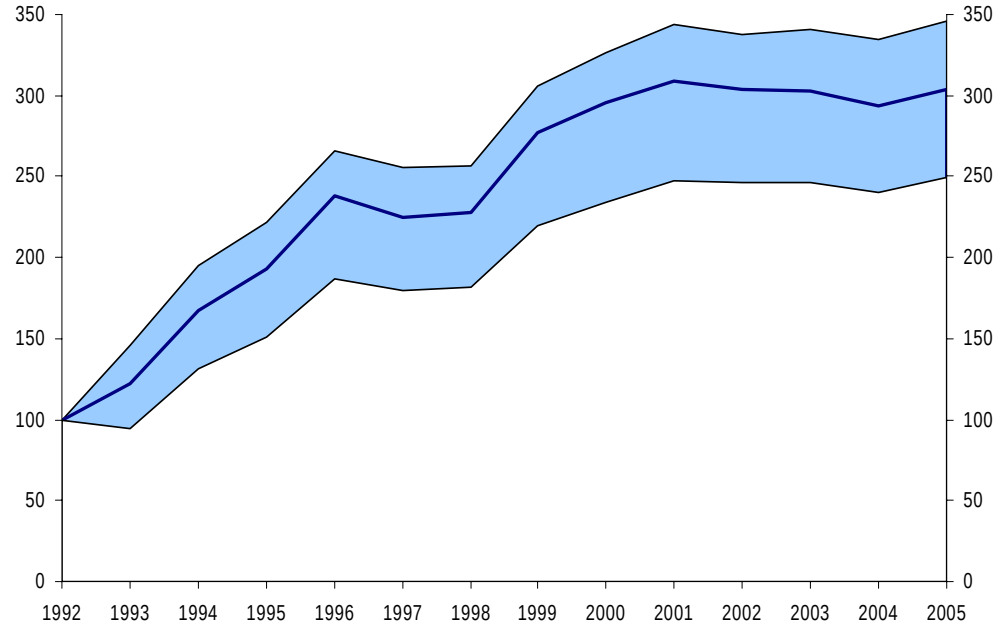
Source: BERR calculations

Fugure C6. Variable added to sub-domain: Labour supply



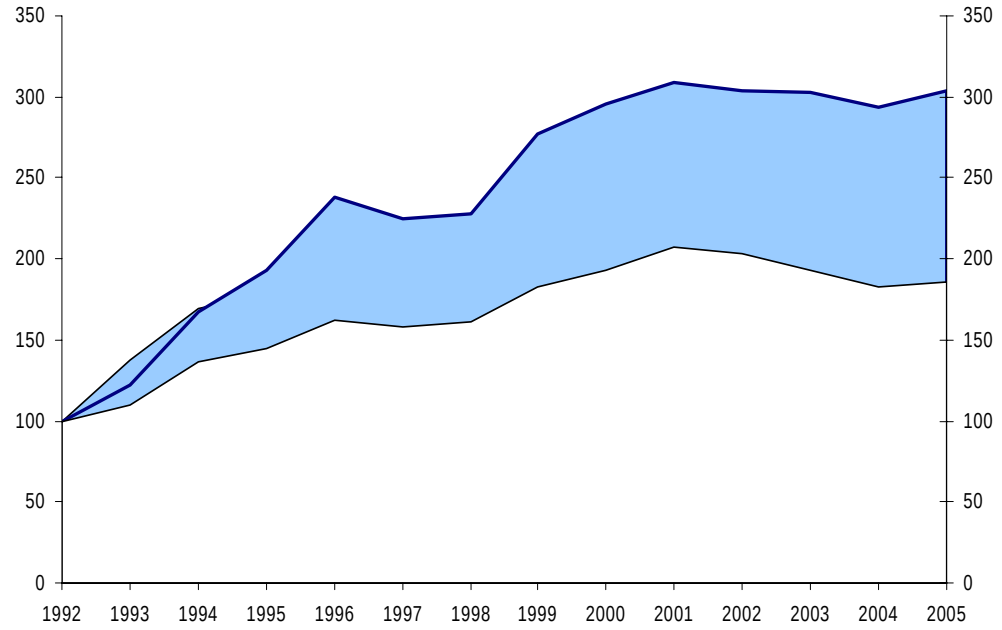
Source: BERR calculations

Figure C7. Variable added to sub-domain: Pay flexibility



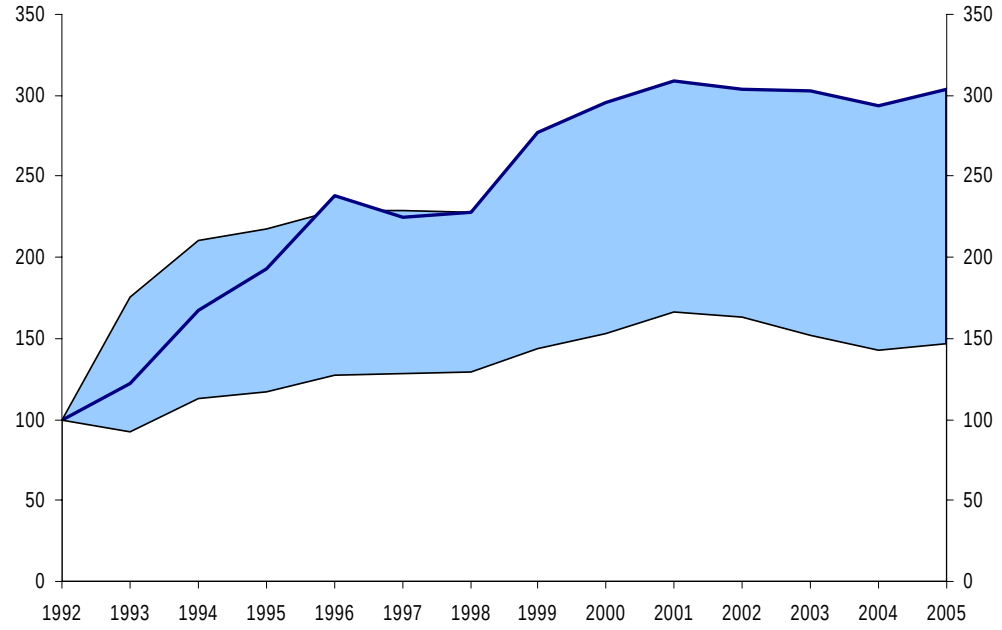
Source: BERR calculations

Figure C8. Variable added to sub-domain: Reservation wage



Source: BERR calculations

Figure C9. Variable added to sub-domain: Non-wage labour costs



Source: BERR calculations

Annex D: Time series

This annex sets out the values for the four indices of adaptability.

As discussed in the main report, ILMA 1 and ILMA 2 differ only in the level of which we apply a linear scale transformation to the data in the aggregation procedure. ILMA1 applies a linear scale transformation after aggregating the standardised base-indicators into sub-domains, while ILMA2 applies the linear scale transformation at the level of the base indicators.

ILMA1(adj) and ILMA2(adj) are the cyclically adjusted versions of ILMA1 and ILMA2 respectively.

Table D1. Time series for aggregate Index of Labour Market Adjustment measures*

	Not cyclically adjusted		Cyclically adjusted	
	ILMA 1	ILMA 2	ILMA 1 (adj)	ILMA 2 (adj)
1992	100.0	100.0	100.0	100.0
1993	163.1	135.5	185.7	122.4
1994	185.0	164.8	208.0	167.1
1995	185.3	173.1	239.1	192.5
1996	263.3	215.5	358.5	238.5
1997	213.7	186.4	321.3	224.6
1998	175.7	183.5	288.4	228.0
1999	214.5	218.2	336.3	277.4
2000	223.1	225.1	381.3	295.4
2001	241.8	237.9	414.0	309.0
2002	228.9	233.6	380.7	303.5
2003	224.7	230.1	381.2	302.5
2004	193.3	218.8	305.3	293.5
2005	200.5	225.6	304.4	303.5

Source: BERR estimates, derived from the ONS Labour Force Survey and other data sources.
* Estimates are for the United Kingdom, and are subject to revision. Not seasonally adjusted.

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