Exploring Local Areas, Skills and Unemployment

The Relationship Between Vacancies and Local Unemployment

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CONTENTS

TABLES

LIST OF FIGURES

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EXECUTIVE SUMMARY

This report investigates the relationship between vacancies and local unemployment using data from a representative establishment-level survey undertaken between November 2000 and March 2001, namely the Employers Skill Survey 2001.

The report extends the spatial analysis presented in *Exploring Local Areas, Skills and Unemployment: Exploratory Data Analysis at Local Area Level* (Green and Owen, 2002) which finds a generally negative but statistically weak relationship between hard-to-fill vacancies and local unemployment at the local Learning and Skills Council (LLSC) level. The relationship between skill-shortage vacancies and local unemployment is even weaker. Indeed, paradoxically, Green and Owen find that a number of LLSCs have both a high vacancy rate and a high unemployment rate. This finding gives rise to concerns regarding the operation of the labour market in these areas and forms the focus for *ELASU: Case Study Report* (Hogarth *et al*, 2002).

In this report, the establishment-level distributions of total vacancies, hard-to-fill vacancies and skill-shortage vacancies are examined in detail. There is much greater variation in establishments' vacancies within regions than there is between regions. Similar findings hold for LLSCs and for industrial sectors. However, differences in establishment size are more important – vacancy rates are lower for larger establishments, and vary considerably by establishment size.

Estimates for an empirical model for the joint determination of any vacancies at the establishment (vacancy 'incidence') and the conditional vacancy rate (vacancy 'intensity') are presented. Firm, establishment, industrial and local labour market characteristics are all found to be significant determinants of both vacancy incidence and vacancy intensity, in aggregate, and also for those subsets of vacancies which are hard-to-fill and those due to skill-shortages.

Despite identifying a large number of statistically significant explanatory variables, there still remains considerable variance in vacancy incidence and vacancy intensity that cannot be accounted for by the observable and measurable differences between establishments. This is partly a consequence of the high level of labour turnover (vacancy flows) in relation to the number of vacancies at any point in time (vacancy stock).

However, there exists a statistically significant negatively sloped relationship between total vacancies and local (LLSC) unemployment. There is some variation in the strength of this relationship, with some LLSCs having a greater responsiveness of vacancies to changes in unemployment than others.

This negative relationship between vacancies and local unemployment also exists for the differing subsets of vacancies, although it is weaker for hard-to-fill vacancies and weaker still for skill-shortage vacancies. This accords with expectations since these are precisely the type of vacancies that the unemployed are least likely to be qualified for. For the 80% of vacancies which are unrelated to skill shortages, vacancies are rather more responsive to changes in local unemployment.

Thus, the relationship between establishment-level vacancies and local unemployment is indeed broadly consistent with an underlying local UV or Beveridge curve.

1.   Introduction and Background

This report is the second component of the Department for Education and Skills sponsored project entitled *Exploring Local Areas, Skills and Unemployment* (ELASU). The principal aim of the project is to develop an understanding of the nature of the relationships between recruitment problems (as evidenced by job vacancies), workers' skills, and local unemployment.

In the first component of this project - *Exploratory Data Analysis at Local Area Level* - Green and Owen (2002) show that the co-existence of high vacancy rates and high levels of unemployment in 'local' labour markets is not uncommon. While this seems to be paradoxical at first sight – there are both 'jobs without workers' and 'workers without jobs' in the same local area – a myriad of plausible explanations exist for this phenomenon. These include:

- 'mismatch' between the stock of unfilled vacancies and unemployed individuals - perhaps particularly with regard to the skills and competencies of the unemployed and the technical requirements of the unfilled jobs;
- problems with the operation of the local labour market in terms of allocating workers to jobs and jobs to workers – such as poor individual job search effectiveness and/or failures in the recruitment strategies of companies;
- temporal misallocations arising through sluggish adjustment and change especially in periods of rapid workplace developments, which may be exacerbated by more macro-based persistence effects in unemployment;
- occupational or geographical immobility - perhaps related to local costs, relative wages and rigidities associated with housing ownership and prices;
- high reservation wages amongst the unemployed relative to the employment opportunities available;
- functional differences in the geographical identification of 'local' labour markets (particularly for vacancies) especially in regions with high levels of commuting; and
- differences in the sectoral distribution of firms and in local labour market characteristics which together can account for the observed heterogeneity in turnover rates and local unemployment rates.

Of course, these various explanations may be complementary rather than competing reasons for what appears to be a breakdown in the local UV (unemployment-vacancy) or Beveridge curve which would predict higher unemployment where vacancies are few in number and lower unemployment where vacancies are plentiful. Clearly, rather different policy conclusions and prescriptions follow according to which, if any, of the above potential explanations for the co-existence of vacancies and unemployment in local labour markets is supported by the empirical evidence. Hence the broad objectives of this report are first to further investigate the nature of any link between vacancies and the local unemployment rate and then, secondly, to provide evidence which may facilitate in distinguishing between these different explanations and their relative importance.

Green and Owen (2002) document the relationship between vacancies and local unemployment using the Employers Skill Survey 2001 (ESS2001). A key advantage of ESS2001 is that it identifies not only the number of vacancies, but also the nature of the vacancies on offer. In particular, it is possible to distinguish within the total stock of vacancies, the number that the respondents consider are hard-to-fill and

also, of those, the number that are hard-to-fill because of skill shortages[1]. Indeed, Green and Owen (2002) make use of these distinctions in their report. Their conclusion from detailed graphical and statistical analyses of the data is that there is a generally negative, but statistically weak, relationship between hard-to-fill and skill-shortage vacancies and 'unemployment'[2] at the 47 local Learning and Skills Councils (LLSC) area level[3].

The evidence for the apparent breakdown in the UV curve is not confined to the relatively few LLSCs which Green and Owen (2002) identify as having relatively high unemployment (or non-employment) together with high levels of hard-to-fill and skill-shortage vacancies[4]. In addition, there are 14 LLSCs with both relatively low unemployment and low vacancies, which also therefore appear 'paradoxical' according to the conventional understanding that there should be an inverse relationship between unemployment and vacancies. However, it is clearly the former set of LLSCs with both high vacancies and high unemployment that is of greater interest from a policy perspective.

It is important to note that the theory underlying the expected negative UV relationship is based on a matching function between the number seeking employment and the number of jobs available, without regard to the nature of the vacancies. That is, conventional UV analysis describes general dynamic labour market turnover – i.e. the relationship between unemployment and total vacancies. In contrast, Green and Owen (2002) focus their attention on the subset of vacancies which are hard-to-fill and/or due to skill shortages amongst the applicants. The fact that they find only a very weak inverse relationship between unemployment and skill-shortage vacancies, for example, is therefore perhaps unsurprising since these are exactly the vacancies that the unemployed are *least* likely to be able to fill given the well-documented dominance of unskilled individuals in the unemployed stock. Moreover, as shown below, skill-shortage vacancies are only a small fraction of total vacancies. Hence the failure to uncover a significant negative relationship between unemployment and skill-shortage vacancies does not necessarily contradict the prediction of conventional UV theory since this finding does not preclude the existence of a significant negative relationship between unemployment and *total* vacancies (and/or non-skill-shortage vacancies). Thus, where there are jobs available for which the unemployed have the appropriate skills and attributes, then lower unemployment should be associated with higher vacancies and *vice versa* – that is, the data can be expected to reveal a downward sloping local UV curve. In order to investigate this possibility, in this report the relationships between

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[1] Skill-shortage vacancies are defined as those that the respondents state are hard-to-fill because of low numbers of applicants with the required skills, work experience or qualifications that the company demands. For consistency, this is the definition of skill-shortage vacancies used in all previous analyses using the Employers Skill Surveys (see, Hogarth *et al*, 2001, Bosworth *et al*, 2000a, 2000b, *inter alia*).

[2] 'Unemployment' is measured in four ways: as the claimant count rate; the long-term count rate (for those with unemployment durations in excess of 6 months); the ILO-defined unemployment rate; and the 'non-employment' rate.

[3] For the 21 bivariate regression relationships they estimate between various measures of hard-to-fill and skill-shortage vacancies and local unemployment (or non-employment) rates, only six are statistically significantly different from zero at conventional levels, only one of which involves skill-shortage vacancies (see Green and Owen, 2002, Figure 9 to Figure 29). Since these regressions are formally equivalent to calculating the correlation coefficient between vacancies and unemployment, these results indicate that hard-to-fill vacancies, and skill-shortage vacancies in particular, are largely uncorrelated with local unemployment rates.

[4] There are six LLSCs in this group, namely: London Central, London East, Cumbria, Lancashire, Birmingham & Solihull and Devon & Cornwall. See Annex C for further details.

unemployment and total vacancies, as well as for the subsets of hard-to-fill and skill-shortage vacancies (and their complements – i.e. vacancies that are not hard-to-fill, and vacancies that are not related to skill-shortages) are all separately examined.

This disaggregation by vacancy type is also important because the distinctions in the nature of vacancies can be used to attempt to differentiate between the various competing hypotheses for the coexistence of high vacancies and high unemployment in certain local labour markets. For example, evidence in favour of the skills-mismatch hypothesis would be a conventional negatively-sloped UV curve between unemployment and those vacancies that are 'non-skilled', with no relationship (or even a seemingly perverse positive relationship) between unemployment and skill-shortage vacancies. The conclusion would then be that high unemployment in these locations is therefore due to a shortage of jobs for which the unemployed are suitable or eligible. If, however, there is no apparent relationship between unemployment and 'non-skilled' vacancies, then this suggests that that the unemployed are not able to get, or do not accept, jobs for which they are most likely to be qualified. This would be indicative that other causal influences – such as poor search and recruitment strategies, geographic or occupational immobility or too high wage expectations – are more likely explanations for the coexistence of vacancies and unemployment in the same local labour market area.

Another possible interpretation of the Green and Owen (2002) finding of only a very weak relationship between vacancies and local unemployment is that due to structural and/or frictional differences within local labour markets, there is significant variation in the UV relationship *within* the LLSCs. Thus, in this report, the analysis goes beyond the LLSC-aggregated UV analysis and provides a detailed examination of the underlying determinants of vacancies at the establishment level. This will reveal whether the many other factors which influence vacancies serve to obscure any underlying UV relationship, or whether the propensity of firms to have positions vacant is largely unrelated to the local unemployment rate once the other factors which determine vacancies have been taken into account. Given the relative paucity of research on the determinants of vacancies[5], this report also serves to contribute to the general understanding of both the factors and the nature of the processes which give rise to firms having jobs available.

Thus, the first task of this report is to document the evidence on vacancies from the ESS2001. In part, this replicates sections of Green and Owen (2002) except that here the analysis will be at the individual *establishment* level, rather than at the *LLSC* level using LLSC-aggregated employment-based statistics as in Green and Owen (2002). Given that most of the variation in vacancies is *within* rather than *between* LLSCs (see section 3.2 below), retaining the individual establishment-level information on vacancies rather than averaging it across the LLSC areas will facilitate the investigation of the variation in and, thereby, the determinants of vacancies. Green and Owen (2002) use the average vacancy rates for each of the LLSCs, and thus average out this within-LLSC variation in the data. Of course, when examining the UV relationship, unemployment is not defined at the establishment level. In order to facilitate comparisons with Green and Owen (2002), unemployment rates are

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[5] This contrasts with the considerable effort that has been expended into examining the determinants of unemployment. However, a recent notable exception which examines the propensity for establishments to have skill-shortage and hard-to-fill vacancies, as well as recruitment difficulties, is Haskel and Martin (2001).

therefore computed at the LLSC area.

The choice of the unit of analysis is also important and is related to the issue of weighting. In Green and Owen (2002), the analysis is primarily at the LLSC level and is employment-weighted. In contrast, the unit of analysis in this report is mainly the establishment, and the data are therefore establishment-weighted (see also Forth *et al*, 2002). The difference between these two alternatives is perhaps best understood with an example. The average vacancy rate can be measured in two ways. If employees selected at random from the workforce are asked how many vacancies there are at their workplaces, and how many workers, then the ratios of the two will yield the employment-weighted average vacancy rate. However, if only randomly selected establishment managers are asked how many vacancies there are their workplaces and how many workers, then the ratio of these will provide the establishment-weighted average vacancy rate. The difference is that in the first case, larger establishments are more likely to be sampled since they have more employees, whereas in the second case, all establishments have an equal change of being sampled irrespective of their size. The choice between the different weighting strategies - employment or establishment - depends on the questions being asked[6]. If the analysis is primarily concerned with documenting how many vacancies there are, then the appropriate weighting is by employment. However, if the analysis is more concerned with the circumstances under which vacancies are generated and/or filled (or remain unfilled), then an establishment-based approach is arguably of greater interest since this is the relevant unit of analysis (e.g. for human resource management policies and practices) at which any mismatch between the skills of the applicants and the requirements of the jobs would be identified. The establishment (or firm) is also the level at which at which vacancies are initially identified, notified/advertised and filled, and hence any analysis of vacancies is most usefully conducted at the establishment level. In contrast, the employment-level analysis conducted by Green and Owen (2002) is better suited to describing the aggregate (and spatially disaggregate) statistics on the number of vacancies and the average vacancy rate within the workforce.

An important limitation of the previous discussion, and of the exploratory analysis in Green and Owen (2002) as they themselves highlight, is that bivariate correlations between vacancies and local unemployment rates do not account for other potential influences on the level of vacancies. Thus, for example, establishments in areas dominated by rapidly growing (declining) industries may be expected to have above (below) average vacancy rates when surveyed, and this may distort the estimated UV relationship if such differences are not controlled for in the empirical analysis. Other potential influences on the level of vacancies include: the level of labour turnover at the establishment; human resource practices such as training; other sectoral features such as national and international competition; cyclical and seasonal factors; occupational mix; regional factors such as wage and price differentials, costs and ease of travel etc; other local labour market characteristics such as the supply of skills, occupational composition and relative pay. These factors

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[6] Note that this weighting is in addition to the reweighting which ensures that the ESS2001 sample distribution is the same as the population (England) from which it was drawn despite the quota-based sampling strategy used to compile the ESS2001 (see Hogarth *et al*, 2001 for further details). That is, in both employment-weighted and establishment-weighed reweighting schemes, the resulting estimates will be representative of the population – of the employed and of all establishments respectively – in England as a whole.

will all impact upon how quickly and easily any vacancy is likely to be filled, and thus on the probability of there being a vacancy at the establishment.

Thus the second major task of this report is to investigate the UV relationship at the local level while taking account of the characteristics of the establishment and the local labour market which may impinge upon this relationship. It is clear that workforce and workplace factors as well as the nature of the local labour market can all potentially affect the relationship between vacancies and unemployment as depicted in the UV curve. Hence, the multivariate analysis which will incorporate the various potential influences on the level of vacancies will first identify the factors which contribute to high or low levels of vacancies at the establishment, and then establish whether there exists any relationship between vacancies and local unemployment conditional on these factors[7]. It will also determine the nature and importance of the workplace and workforce factors which contribute to explaining differences in vacancy rates. The interpretation of these results will facilitate the interpretation of the results in Green and Owen (2002), and also contribute to understanding the high vacancy-high unemployment LLSCs identified in their report[8].

In conclusion therefore, the key research questions and issues that this report will address are:
- What are the key features of the distribution of the different categories of vacancies at the establishment level?
- What are the important determinants of vacancy incidence and vacancy rates?
- Can an establishment-level UV/Beveridge curve between different categories of vacancies and the local unemployment rate be identified?
- How can the estimated vacancy relationships be used to understand the 'paradox' of high skill-shortage and hard-to-fill vacancy rates and high unemployment rates in certain localities? In particular, is it possible to distinguish between the various competing/complementary explanations?

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[7] Conventionally, empirical Beveridge curves are specified with unemployment being a function of the vacancy rate (and other variables) – so that the causality implicitly runs from higher vacancies leading to lower unemployment (and *vice versa*). However, it has been recognised that the causality could be reversed – that where unemployment is low, vacancies may be high because of a shortage of workers, or that vacancies and unemployment may be simultaneously determined. Nevertheless, certainly at the aggregate level, recent research indicates that the potential simultaneity between vacancies and unemployment does not appear to seriously bias the coefficients of the estimated relationship (Nickell *et al*, 2002). Moreover, given that the analysis in this report is at the micro-level, the local area unemployment rate can be reasonably taken as given rather than jointly determined with the level of vacancies at the establishment.

[8] There is a synergy here with a parallel project using the ESS2001 being undertaken jointly with NIESR. Mason and Stevens (2002) analyse the determinants of vacancy rates in a number of specific occupations, although their unit of analysis is the individual vacancy (and whether it is hard-to-fill, or due to skill shortages). In this sense, the establishment-based analysis in this report bridges the gap between the LLSC-level analysis in Green and Owen (2002) and the vacancy-specific analysis in Mason and Stevens (2002).

2.   Some Theory and Previous Evidence on Vacancies and Local Unemployment

2.1   Matching Functions and UV/Beveridge Curves

Modern theories of the relationship between unemployment and vacancies are mainly derived from the notion of a matching function. Petrongolo and Pissarides (2001) present a recent and comprehensive survey of the theoretical and empirical literature. A matching function, M, is a relationship between the number of job matches or hires (denoted M), the number of vacancies currently available (denoted V), the number of unemployed workers looking for jobs (denoted U), and perhaps some other factors (X say), which impact upon the matching process and influence the degree of 'mismatch' between the unemployed and the stock of vacancies. These additional factors may include search intensity, geographic mobility, measures of skills and skill requirements etc. The matching function can thus be written as:

$$M = M(V, U, X),$$

with $M_V > 0$ and $M_U > 0$, so that the greater the number of vacancies, or number of unemployed workers, the higher the expected number of matches/hires in any time period. M is typically specified to be Cobb-Douglas in form and the rate of job matching can therefore be expressed in terms of a log-linear function of the unemployment and vacancy rates. In steady-state equilibrium, the number of matches is equal to the number of job separations (the number of quits plus fires) which is usually assumed to be some constant proportion of employment reflecting an exogenous quit rate. Thus, given X and a fixed job separation rate, this yields an inverse relationship between the vacancy rate and the unemployment rate which is usually termed the UV or Beveridge curve. The X factors then serve to shift the curve in unemployment-vacancy space.

Two empirical estimation strategies have been employed in the literature on matching functions. First, there are a large number of direct estimates of matching functions utilising data on hiring rates, vacancies and unemployment. The empirical evidence from aggregate and disaggregated time-series studies tends to suggest that matching functions exhibit constant returns such that increases in vacancies and/or unemployment lead to proportionate increases in the number of matches[9]. Estimates for local labour markets in Britain include Coles and Smith (1996) who estimate using cross-section data across travel-to-work areas (TTWAs) and Bennet and Pinto (1994) who utilise time-series data for the Training and Enterprise Councils (TECs) areas. Both studies find evidence in favour of a constant returns matching function with a negative relationship between unemployment and vacancies at the local labour market area level. These studies therefore both support the existence of UV/Beveridge curve at the local area level.

Second, in the absence of data on hiring rates, there are also some estimates of the UV relationship assuming steady-state equilibrium in the labour market and thus constant hiring and separation rates. Wall and Zoega (forthcoming) impose the steady-state assumption and constant returns to estimate UV curves for the 10 standard regions and for Britain as a whole. Using time-series and cross-section county-level data, their main interest is in shifts in Beveridge curves, and in particular,

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[9] See, for example, Pissarides (1986), Blanchard and Diamond (1989) and Coles and Smith (1996), and, in particular, the survey evidence presented by Petrongolo and Pissarides (2001).

whether these are due to structural changes as the theoretical literature presumes[10], or whether they may also shift over the business cycle[11]. In aggregate, they find a statistically significant negative relationship between unemployment and vacancies. However, for the 10 regions separately, six display a positive UV relationship, and only four negative. None are significantly different from zero.

Hence, while at the aggregate level there is clear evidence of a UV/Beveridge curve, the extant empirical evidence at the local level is not entirely conclusive. The direct estimates of matching functions lend strong support for the existence of a negative relationship between vacancies and local unemployment, but some of the indirect estimates (which assume constant hiring and separation rates), together with the exploratory data analysis presented by Green and Owen (2002), are less conclusive. Section 4 of this report thus investigates the local UV relationship in detail.

2.2   Previous Evidence on Vacancies and Vacancy Rates

There has been very little previous research on the determinants of vacancies. In part, this is undoubtedly due to the paucity of data on vacancies and vacancy rates. At the aggregate level, both the US and Canada publish a 'help-wanted index' which records the volume of jobs that are advertised. This is an aggregate series and is clearly useful in the analysis of trends in vacancies and vacancy rates. However, it is clearly a very imperfect measure of the number of vacancies. Similarly, in the UK, vacancies are measured as the number of jobs reported to Employment Offices. The Employment Service estimates that on the basis of occasional surveys, approximately one third of all vacancies nationally were brought to the attention of Jobcentres, while about one quarter of all hirings were made through Jobcentres. Hence, this aggregate series is again likely to be a considerable underestimate of the actual number of jobs available[12], but it should be a good indicator of the trend in the number of vacancies and the vacancy rate[13]. However, there would appear to be no nationally representative disaggregated regional, industrial, or occupational data series on vacancies for the UK prior to the ESS1999 and ESS2001 surveys[14].

The matching function literature and estimates of the Beveridge curve typically take the number of vacancies, or the vacancy rate, as given. In this report, an important objective is to investigate the determinants of vacancies at the establishment level. Previous studies include Haskel and Martin (2001) (UK), Holzer (1994) (US), and

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[10] For example, hysteresis-type effects may shift the Beveridge curve due to the adverse effect on the search effectiveness of the unemployed because of (long and/or multiple) spells of unemployment. These denude their work skills and their attractiveness to employers, which thereby affects the matching rate between the unemployed stock and the vacancies available.

[11] In particular if vacancies adjust more quickly than unemployment or if on-the-job search has a cyclical component, then the matching function (and hence the Beveridge curve) may shift with the cycle. Their main conclusion is that there has indeed been considerable movement in the Beveridge curve over the business cycle in Britain over the last 25 years, which has important implications for the understanding of the persistence of unemployment.

[12] In addition, the introduction of Employer Direct will have had a major impact on the continuity of the series since May 1991.

[13] One caveat to this is that recent years have seen a number of significant changes in recruitment strategies operated by both large and small firms. The growth of the internet for advertising vacancies for example, and the phenomenal growth in the use of recruitment agencies will have undoubtedly impacted upon the ways in which companies report vacancies.

[14] ONS has recently started a new monthly enterprise-based survey of vacancies. The first results are presented in Machin and Christian (2002).

Morissette and Zhang (2002) (Canada). The analysis in the following sections is most closely related to that of Holzer (1994) in that the concern here is with both vacancy incidence and vacancy rates. However, in distinguishing between the various types of vacancies (hard-to-fill and skill-shortage vacancies in particular), there are clearly parallels with the recent work of Haskel and Martin (2001) who utilise 1991 Employee Manpower and Skills Practices Survey (EMSPS) together with the 1990 Workplace Employee Relations Survey (WERS). However, direct comparisons between this report and their work is not possible because the definitions of hard-to-fill and skill-shortage vacancies are rather different between the EMSPS and the ESS2001.

3.   Data, Definitions and Modelling Strategy

In this report, the primary dataset is the Employers Skills Survey of 2001 (ESS2001) – see Hogarth *et al* (2001) for further details. This is a telephone survey of approximately 27,000 establishments in England conducted mainly during Spring 2001. The overall response rate from employers was 53%. Variable sampling fractions across regions, industrial sector and establishment size were used and, on the basis of the achieved sample, appropriate weights were subsequently constructed so that the achieved sample can be grossed-up to be representative of the population of just over 2 million establishments in England. The grossed-up distribution of establishments and employment by establishment size bands is presented in Table 1 together with the number of sample observations in each size band. As can be seen, while establishments employing fewer than five workers comprise 72% of all establishments, they only account for around 11% of employment. At the other end of the scale, only 0.14% of establishments employ 500 or more workers, but more than 15% of employment is located in these establishments. As can be seen from the final column of Table 1, larger establishments were 'over-sampled' relative to their distribution in the population in order to more accurately capture the establishment characteristics of the relatively large proportion of employment that is located in these few establishments.

In the analysis that follows, establishment-weighted and employment-weighted statistics are carefully distinguished. In this report, primary interest is in the determinants of vacancies at the establishment level and hence establishment-weighted estimates are the main focus. However, in this section, which comprises mainly descriptive analysis, both employment-weighted and establishment-weighted statistics are presented for comparative purposes.

3.1   Vacancies and Vacancy Rates: Definitions

3.1.1 Definitions of Vacancies
The initial task in this report is to examine the determinants of vacancies of varying types as identified by the respondents in the ESS2001. First, for total vacancies, the question asked in the ESS2001 survey was (question D2):
"How many vacancies, if any, do you currently have at this establishment?"
Note that the question does not distinguish, nor prompt the respondent to distinguish, between internal or external vacancies, nor is it prefaced or followed by questions

which determine whether these 'vacancies' have actually been advertised either internally or externally, nor whether the establishment/firm has actively engaged in any recruiting activity to fill the vacancies. Respondents therefore have to exercise an element of judgement in their responses as to what they consider to be a vacancy as compared to some other surveys which have been rather more explicit in their definition and identification of vacancies. For example, the recent (1999) Canadian *Workplace and Employee Survey* (WES) - as discussed by Morissette and Zhang (2001) - asked respondents first whether vacancies were usually staffed from *within* or *outside* the workplace, and then whether there were any vacancies "that the workplace was currently trying to fill"[15], and if so, how many. Similarly, the UK's *National Survey of Engagements and Vacancies* (1977) defined a vacancy as a job which "is currently vacant, available immediately and for which the firm has taken some specific recruiting action during the last four weeks" (reported in Jackman *et al*, 1989). The Canadian *Job Vacancy Survey* 1971-78 took a similar definition (although, in contrast, the more recent WES explicitly does not since its responses include vacancies that are only available to applicants from within the workplace/firm). Finally, the new ONS Vacancy Survey (VS) (see Machin and Christian, 2002) defines a vacancy as a position which is available to suitable candidates from outside the business or organisation concerned, and for which the employer has taken 'active steps' (such as advertising, notifying a Jobcentre or private employment agency etc) to fill.

Hillage *et al* (2002) document a qualitative investigation of respondents' interpretation of 'vacancies' (and some other terms and definitions) in the 2002 Employers Skill Survey. A small number of follow-up interviews were undertaken with survey respondents in an attempt to investigate the validity and reliability of the data series. The evidence from these follow-up interviews is encouraging in that a relatively unambiguous view emerged and the interviewees had a fairly clear idea of what constituted a vacancy[16]. This focus on the definition of a vacancy is important since the economic concept of a vacancy is that of a job which is unfilled and available (and hence notified) to external applicants. Clearly, perhaps especially in larger establishments and firms, some vacancies may be effectively reserved for incumbents and thus the ESS2001 may overstate the number of jobs available to unemployed workers. On the other hand, as noted by Ostry and Sunter (1970), requiring employers to be engaged in some recruiting activity may exclude some genuine vacancies since some employers will have stopped looking because of their previous lack of success in trying to recruit – a similar concept to the discouraged worker effect when recording unemployment under the standard ILO definition. Moreover, in multi-establishment firms/organisations, the establishment respondent may be unaware of the recruitment strategies conducted by their 'head-office'. Finally, at the establishment level, the locus of responsibility may be such that while the respondent considers there to be a need for more staff, those ultimately in charge of recruitment may not be similarly inclined. These potential weaknesses in the measurement of vacancies need to be considered when assessing the conclusions and implications of the analysis presented below. However, clearly the findings

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[15] These questions were asked separately for eight different job categories: managers; professionals; technical/trades; marketing/sales; clerical/admin; production; other. This is similar to the occupational groups used in ESS2001.

[16] Generally, there was a degree of formality attached to it: there was a specific slot to fill, which may have required approval, especially where there was a defined staffing level or establishment. A vacancy referred to permanent positions and involved active recruitment, rather than taking people 'on spec'.

presented by Hillage *et al* (2002) lend greater confidence to the interpretation and analysis of the ESS2001 vacancy data[17].

Secondly, a number of sub-categories of total vacancies are examined, namely hard-to-fill vacancies and skill-shortage vacancies. The relevant question in ESS2001 is (question D6):
   "Are any of the vacancies you currently have for (occupation) proving hard-to-fill?" Similar problems to those noted above for total vacancies potentially arise with the definition of hard-to-fill vacancies. Again, there is no precise definition provided of 'hard-to-fill' and clearly this is open to interpretation by the respondents[18]. Nevertheless, to facilitate comparisons with previous analyses of ESS2001 (especially Green and Owen, 2002), and with the analyses of the previous Employers Skills Survey (ESS1999 – see Bosworth *et al*, 2000a; 2000b), the simple response to question D6 is used to identify hard-to-fill vacancies throughout this report despite the potential differences in interpretation between respondents. Those vacancies that are not hard-to-fill are denoted non-hard-to-fill vacancies.

Finally, skill-shortage vacancies are defined as hard-to-fill vacancies which are skill related in that at least one of the following causes were cited by the respondent (question D12): low number of applicants with required skills; lack of work experience the company demands; lack of qualifications the company demands. The complementary set of vacancies is denoted non-skill-shortage vacancies.

An important advantage of the ESS2001 is that the questions were asked of a large number of establishments across spatial and industrial groups and different establishment sizes. Moreover, the ESS2001 sample is representative of all establishments and employment in England at the survey date. Hence, the findings reported below are unlikely to be adversely affected by any particular systematic bias for certain types of establishments to over or under-report the number of 'vacancies' actually available to unemployed individuals, or to utilise systematic differences in their classification of 'hard-to-fill' vacancies. That is, the responses in the ESS2001 can be interpreted with respect to some average interpretation applied by the respondents to the relevant questions, and generalised to the population from which the sample was drawn.

3.1.2 Definitions of Vacancy Rates
The establishment-level vacancy rate is defined as the fraction of unfilled jobs (i.e. vacancies) out of the total number of jobs at the establishment, where the latter is the sum of current employment and vacancies. That is, the vacancy rate, v, is defined as $v = V/(E+V)$ where V is the number of vacancies and E is current employment. Holzer (1994), Statistics Canada (reported in Morisette and Zhang, 2001, p.2, fn.4) and

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[17] An explicit comparison of the vacancy statistics in ESS2001 and in the ONS VS is presented in Machin and Christian (2002). While the total number of vacancies reported in ESS2001 appears to be roughly 40% above the comparable figure from the ONS VS, this is probably mainly due to the lack of a formal definition of a vacancy in ESS2001. However, the distribution of vacancies by industry in the two surveys is very similar.

[18] Subsequent to ascertaining how many hard-to-fill vacancies there are for each occupational category, respondents were asked how long the vacancies had lasted. This information could perhaps be used to more precisely identify the concept of a 'hard-to-fill' vacancy and to provide comparable responses between establishments – a similar, duration-based, approach has been used in other surveys to define hard-to-fill vacancies. However, even a vacancy which has only been available for a short time may already be regarded as 'hard-to-fill' if it has attracted only a few or only substandard applicants. Hence, the respondents' subjective responses to D6 are used in this report to identify the number of hard-to-fill vacancies.

Morissette and Zhang (2001) all utilise this definition of the vacancy rate[19]. In contrast, Green and Owen (2002), use vacancy density, defined as V/E, as their measure (partly in order to maintain comparability with their previous spatial analyses of the ESS1999 data which utilised the density measure). Clearly, at the margin, for large establishments, whether vacancy rates or densities are used makes little difference to the calculated vacancy intensity. Similarly, at the LLSC level, vacancy density and vacancy rate measures will be similar since the number of vacancies is typically small in relation to total employment. However, for small establishments (which dominate the population of establishments as seen in Table 1), large differences in the reported vacancy rates are produced if the vacancy density measure is used. For example, suppose that an establishment has four jobs, one of which is currently vacant. Then the vacancy rate as used in this report is 25%, while using V/E as the measure yields 33%. Given that the analysis in this particular report is at the establishment level, then the vacancy rate measure seems to be more appropriate, especially given that it is its relationship with the unemployment rate (rather than unemployment density) that is under investigation. Further comparisons and a discussion of the relative merits of vacancy rates and vacancy densities are presented in Annex A.

Separate vacancy rates are calculated for all vacancies, and the two paired sub-categories of hard-to-fill and non-hard-to-fill vacancies, and skill-shortage and non-skill-shortage vacancies. Clearly the intensity of these sub-sets of vacancies and their determinants may be rather different from that for vacancies as a whole, and hence these different categories of vacancies are investigated separately in the following analysis.

3.2 Vacancies and Vacancy Rates: Descriptive Statistics

3.2.1 Vacancies

Panel A of Table 2A reports the proportion of establishments in England reporting any vacancies, any hard-to-fill vacancies, any non-hard-to-fill, any skill-shortage and any non-skill-shortage vacancies. Panel A of Table 2B reports the same vacancy incidence statistics but expressed as a proportion of total employment in England. Thus Table 2A, column 1 reveals that 14.5% of establishments reported that they had some vacancies, and these establishments comprised 44.2% of employment as shown in Table 2B, column 1 (and thus 44.2% of workers were working in an establishment with at least one vacancy). The remaining columns show that 7.5% of establishments covering 22.1% of all workers had some vacancies that were deemed by the respondents as being hard-to-fill, while 8.3% of establishments covering 32.5% of employment had vacancies which were non-hard-to-fill[20]. Similarly, 3.7% of establishments covering 10.7% of employment had some vacancies which were hard-to-fill because of skill-shortages while 11.9% of establishments employing 39.3% of all workers had some vacancies which were not due to skill-shortages. As

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[19] Holzer (1994, p.21): "Vacancy rates are thus defined as the fraction of vacancies out of total jobs in the firm, where the latter is the sum of current employment and vacancies". Morissette and Zhang (2001, p.2, fn.4): "The vacancy rate - the number of job vacancies divided by the number of jobs (where the latter is the sum of the level of employment and the number of vacancies) …"). Morissette and Zhang (2001, p.5): "The number of jobs (i.e. employment plus number of job vacancies) …".

[20] Note that these do not add to give the total in column 1 since several establishments have both hard-to-fill and non-hard-to-fill vacancies.

noted in Hogarth *et al* (2001), the statistics for hard-to-fill and skill-shortage vacancies are slightly lower than the proportion of establishments reporting such vacancies in ESS1999 once the smaller (less than 5 employees) establishments which were not surveyed in 1999 are excluded. This fall in vacancy incidence has occurred despite the fact that recorded unemployment in England fell between the two survey dates.

In order to assess the regional, sectoral and size composition of vacancy incidence, the remaining four panels of Table 2A and Table 2B report the same measures of vacancy incidence disaggregated by region (Panel B), main industrial activity (Panel C), broad sector (Panel D) and establishment size (Panel E). The proportion of establishments and of employment with some vacancies is marginally higher in the south and east than in the north and west, with the West Midlands belonging to the former cluster and the East Midlands with the latter. This weak regional pattern is also broadly apparent in the distribution of the four sub-categories of vacancies – the different measures are all positively correlated with each other and with the incidence of any vacancies. This regional disparity would appear to be inversely related to the regional unemployment rate (and non-employment rate), and this consistent with what might be expected from a matching model/Beveridge curve explanation for the relationship between vacancies and unemployment. The exceptions are London and West Midlands which record both relatively high unemployment and non-employment rates and a high propensity for establishments to report vacancies. Graphically, the regional distributions of vacancy incidence by establishment and by employment are shown in Figure 1A and Figure 1B respectively. These show most clearly the relatively narrow regional variation in vacancy incidence.

There is considerably more variation in the propensity of establishments to report vacancies, and the type of vacancies they report, by industry type than by region. Around one quarter of education, health and social work, and public administration establishments report that they have some vacancies, with a consequence that between 50% and 60% of workers in those sectors are working in establishments which are at less than full employment. Outside these public-sector establishments, those in electricity and water supply and finance also have a high propensity to report that they have some vacancies. In contrast, very few establishments in mining and quarrying, agriculture and construction report that they have any vacancies.

The establishments in education and health and social work report that they have vacancies that are particularly hard-to-fill – the probability of having such vacancies is more than twice the national average in education. While there is no further information to help identify these establishments, a strong possibility is that these hard-to-fill vacancies are in schools (and colleges) and hospitals and reflect the widespread and frequent reports of problems in recruiting teachers and nurses. While these represent only a small proportion (2.28 + 4.37 = 6.6%) of all establishments, they comprise a rather larger proportion of employment (7.33 + 10.34 = 17.7%) due to their size. In the electricity and water supply industry, (0.075/0.215=) 35% of establishments which report that they have some vacancies record that some of these vacancies are hard-to-fill due to skill shortages. However, this is a very small sector both in terms of the number of establishments and the numbers employed in those establishments. All three of these sectors also report that they have non-hard-to-fill and non-skill-shortage vacancies at well above the average national rates.

Clearly, these sectors can be characterised as having severe recruitment difficulties. These differences between sectors are illustrated in Figure 2A and Figure 2B.

This distribution in responses by industry type is reflected in the sectoral propensity to report vacancies as shown in the Panel D Table 2A and Table 2B. Almost one fifth of establishments in the public sector have vacancies of some kind - this is a higher proportion than even in the voluntary sector. Both sectors, but particularly the public sector, would appear to have high turnover and/or recruitment difficulties – they both tend to have high levels of both hard-to-fill and non-hard-to-fill vacancies relative to the private sector, with those in the voluntary sector particularly hard-to-fill, mainly due to skill-shortages amongst the applicants. Graphically, these differences are illustrated in Figures 3A and 3B.

The final panel of Tables 2A and 2B decomposes vacancy incidence by establishment size. Here the differences between the categories are considerable, with smaller establishment having significantly lower incidence rates by establishment and by employment as would expected. This is due at least in part to the indivisibility of a 'vacancy'[21]. The incident rates for all categories of vacancies increase monotonically with establishment size as shown in Figures 4A and 4B. However, the *relative* increase in the incidence of hard-to-fill and skill-shortage vacancies is rather less than their complements of non-hard-to-fill and non-skill-shortage vacancies respectively.

3.2.2 Vacancy Rates

Tables 3A and 3B reports mean vacancy rates (measured as a proportion of jobs in the establishment as discussed above) by establishment and by employment respectively. Once again, the aggregate statistics are supplemented by a decomposition by vacancy types and by region, industry type, sector and establishment size as above. Panel A of Table 3A records that the average establishment has a vacancy rate of 4.2%, half of which are hard-to-fill vacancies, and just under half of those are due to skill-shortages[22]. Thus, on average, more than three-quarters of vacancies at any establishment are not vacant due to skill deficiencies amongst the applicants, but perhaps reflect underlying turnover and adjustment in the workforce. In terms of aggregate employment, however, the vacancy rate is rather lower at 2.7% as shown in Panel A of Table 3B. This therefore implies lower vacancy rates at larger establishments in general. Over 80% of reported vacancies are not skill-shortage related.

As shown in Panel B of Tables 3A and 3B, and Figures 5A and 5B, average establishment-level vacancy rates range from 2.3% in Yorkshire and Humberside to 5.7% in London, although as a proportion of total employment, the range is rather narrower. Finance and business service establishments have relatively high average vacancy rates, while primary sector industries (agriculture, mining, electricity and water) have relatively low average vacancy rates (Panel C of Table 3A and Figure 6A). In terms of employment, however, it is the hotels and restaurants sector which posts the highest vacancy rate: 4.1% of jobs in that sector were unfilled at the time of

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[21] That is, in a two-person establishment, the vacancy rate needs to be 50% before there is a vacancy available, whereas in a 100-person establishment, it only needs to be 1%.
[22] Here, of course, the statistics do sum across the columns, since the two paired categories are mutually exclusive.

the survey, most of which are unskilled (Panel C of Table 3B and Figure 6B). This may be a reflection of the high turnover rates experienced in this industry. Establishments in the voluntary sector have the highest average vacancy rates and the proportion of vacant positions at 4.1% was almost double that of the public sector (Panel D of Tables 3A and 3B, and Figures 7A and 7B). Finally, as can be seen in Panel E of Tables 3A and 3B, and Figures 8A and 8B, aggregate vacancy rates fall with increasing establishment size as would be expected. However, there are differences between the subcategories of vacancies; non-hard-to-fill and non-skill-shortage vacancy rates are fairly constant (above the smallest size category), and the fall in aggregate vacancy rates are thus driven by lower hard-to-fill and skill-shortage vacancy rates for larger establishment. This may reflect the more extensive recruitment activities in larger firms, as well as their ability to train existing staff and to move incumbents to meet skills needs as they arise within their organisations. Smaller establishments are at a clear disadvantage in all these respects.

There are clear and important differences in the propensity for establishments to report that they have some vacancies and the vacancy rates they report. This is perhaps most clearly evident when we compare Panel D of Tables 2A and 2B and Tables 3A and 3B. While the public sector has the highest proportion of establishments with some vacancies (19.7%), and the highest proportion of workers employed in establishments with some vacant positions (54.0%), it also has the lowest average establishment-level vacancy rate (3.4%) and the lowest proportion of unfilled jobs (2.2%). These differences are clearly most obviously related to establishment size differences between sectors, but other factors are likely to be important too as evidenced by the dissimilarities in the rankings of vacancy propensities and vacancy rates between regions and industry types. These distinctions between vacancy propensities and vacancy rates in part determine the modelling strategy utilised in the next section.

Further descriptive evidence on the distribution of the number of vacancies and vacancy rates by establishment size is presented in Table 4 for any vacancies, Tables 5A and 5B for hard-to-fill and non-hard-to-fill vacancies, and Tables 6A and 6B for skill-shortage and non-skill-shortage vacancies respectively. Vacancy frequencies by establishment size, as well as the proportion of establishments reporting some vacancies (vacancy incidence), the mean number of vacancies and the vacancy rate for just those establishments with some vacancies (i.e. the conditional vacancy rate), and the mean vacancy rate across all firms (i.e. the unconditional vacancy rate) in each size category are reported.

Table 4 for vacancies of any type reveals several important features that are also evident in Tables 5A and 5B and Tables 6A and 6B. First, most establishments, and the majority in every size category with less than 100 employees (which account for more than 98% of all establishments – see Table 1) report no vacancies of any kind. This is illustrated clearly in Figure 9. Where vacancies exist, they are few in number – typically just one or two jobs are available, if any. The proportion of establishments with at least one vacancy increases with establishment size, as does the conditional mean number of vacancies (i.e. the average number of vacancies in establishments that have at least one vacancy). However, the number of vacancies available increases less rapidly than firm size with the consequence that the conditional mean vacancy rate *falls* monotonically with firm size. Thus in the smallest size category (1-

4 workers), the average vacancy rate for establishments with at least one vacancy is 48.8%, while for the largest size category (500 or more workers), the average vacancy rate is only 2.9%[23]. Even the unconditional vacancy rate shown in the final row of Table 4 falls fairly consistently with firm size.

These patterns in the propensity of establishments to have any vacancies, and in the conditional vacancy rate, are replicated in Table 5A and 5B for hard-to-fill and non-hard-to-fill vacancies (illustrated in Figures 10A and 10B respectively) and Table 6A and 6B for skill-shortage and non-skill-shortage vacancies (illustrated in Figures 11A and 11B respectively). The exception is the relative constancy in the unconditional vacancy rate for non-hard-to-fill, and, to a lesser extent, non-skill-shortage vacancies for size categories above the very smallest as noted above. The most obvious interpretation is the indivisibility of individual jobs coupled with the low proportions of establishments with any vacancies. The larger the establishment, the more likely it is that there is at least one vacant position, but when vacancies do occur at smaller establishments, they will account for a larger fraction of the jobs than in larger establishments. However, as noted by Holzer (1994), other factors are also likely to be important. For example, larger establishments are more likely to have human resource departments and hence able to more clearly identify the existence of vacancies.

Finally, in order to more comprehensively illustrate its variation, the total variance in the establishment-level vacancy rate is decomposed into the between- and within-proportions by region, industry type, sector, establishment size and LLSC area. That is, the variance in the vacancy rate across all establishments is calculated, and then the extent to which this variance results from variation in establishments' vacancy rates *within* regions, or *between* regions (or industry types, sectors etc) is computed. Because the variance can be divided (or decomposed) exactly into the between-region and within-region contributions (see, for example, Cowell, 1995), then the proportions of the total variation in the vacancy rates which is due to variation in the vacancy rate within regions and due to the variation in the vacancy rate between regions can be calculated. This gives a first indication of the extent to which differences between regions (or industry types, sectors etc) can explain differences in vacancy rates. This decomposition is evaluated for all five categories of vacancies (i.e. for all vacancies, hard-to-fill and non-hard-to-fill vacancies, and skill-shortage and non-skill-shortage vacancies) and for all establishments (unconditional vacancy rates - Table 7A), and also for just those establishments with positive vacancy rates (conditional vacancy rates - Table 7B).

A number of features of the variation in vacancy rates are revealed. First, when measured across all establishments, almost all of the variation in vacancy rates (for all five categories of vacancies) is within- rather than between-sub-categories. This implies that there is much more variation in the vacancy rates between establishments within any region (industry type, sector etc), than there is between in the vacancy rates between regions (industry type, sector etc). This is perhaps unsurprising, but the scale of the magnitude is notable. More than 99% of the variation in overall vacancy rates between establishments are differences within regions, and less than 1% of the variation is between regions. A similar conclusion

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[23] Note that the estimated conditional vacancy density (V/E) is 123% for the smallest size category (so that, on average, these establishments report more vacancies than current employment).

holds for the other sub-categories, and also for hard-to-fill, non-hard-to-fill, skill-shortage and non-skill-shortage vacancies. One consequence of this finding is that differences between regions (or regional effects) would be expected to account for very little of the variation in the vacancy rate if all establishments are considered together. In part, this finding is a result of such a large proportion of establishments having a vacancy rate of zero irrespective of region etc.

When attention is restricted to those establishments with some vacancies (v > 0), a rather different picture is apparent. First, and as previously noted in the discussion surrounding Tables 4, 5A and B, and 6A and B, conditional vacancy rates differ considerably between establishment size groups: around two-thirds of the variance in vacancy rates is between establishment size groups, and only one-third is within size groups. That is, there is more variation in vacancy rates between size groups than there is within size groups. However for all other sub-categories, the within-category component still dominates the between-category component. One slight exception is that, while there is still little variation in vacancy rates between regions, there is a reasonable proportion between LLSC areas suggesting that the regional dimension disguises differences in vacancy rates that exist at the sub-regional level. This is particularly the case for skill-shortage vacancies - 37.5% of the variation in skill-shortage vacancy rates among establishments is attributable to differences between LLSC areas. Green and Owen (2002) similarly report a high intra-regional variation in vacancies, especially for skill-shortage vacancies. This suggests that a spatial analysis at a higher level of geographical disaggregation is likely to reveal some interesting findings which are not apparent at the broader regional level. This is one of the primary purposes of the case study analysis which forms the third strand of the *ELASU* project (Hogarth *et al*, 2002).

A number of features of the distribution of vacancies have been revealed by the descriptive analysis presented in this section. Establishment-level vacancy incidence and vacancy intensity are seen to vary considerably by establishment size and by industry (and hence sector), while the differences by region are rather smaller. However, the average incidence and intensity statistics disguise a considerable heterogeneity in vacancies within regions, and also within industry and sector. These findings are all replicated in the distributions of the hard-to-fill and skill-shortage subcategories of total vacancies, although the number of such vacancies, especially of the skill-shortage variety, is small. Finally, most establishments have no vacancies, although almost half of all employees work in an establishment with at least one vacancy. This finding reflects that fact that vacancy incidence increases strongly with establishment size.

3.3   Modelling Strategy

As noted above, there is considerable variation in vacancies between establishments. Part of this variation is related to industry/sector, size and geographical location as discussed in the previous section, but there are clearly also a myriad of other establishment characteristics and local labour market factors which can influence the number of vacancies that an establishment may have. As discussed in the introduction, such differences may explain why Green and Owen (2002) were unable to identify a significant negative UV relationship at the LLSC level

in their bivariate analysis. Thus, in this section, the various factors which may determine vacancies at the establishment are taken into account.

Given that the vacancy rate can only be non-negative, together with the fact that most establishments have zero vacancies implies that the estimation procedure cannot be of the simple linear regression variety. The appropriate specification which takes account of the clustering of a large proportion of observations at zero, together with only positive values at the non-zero observations is the Tobit model[24]. However, the findings reported in Tables 4, 5A and 5B, and 6A and 6B indicate that the influence of firm size on the probability of an establishment having non-zero vacancies (vacancy incidence) is positive, while its influence on the mean vacancy rate (vacancy intensity) is negative, and this cannot be accommodated by the simple Tobit specification which restricts the influence of any variable on both the probability of a non-zero observation, and on its magnitude if non-zero, to be the *same* sign. Clearly, there may be other variables which potentially have differential influences on the vacancy incidence and the conditional vacancy rate. In effect, two sets of coefficients are required for each independent variable in any model of the determinants of vacancies while the simple Tobit only yields a single effect.

An appropriate specification which does allow for the kinds of differential effects seen for firm size is the modification of the Tobit model suggested by Cragg (1971)[25]. This is a two equation model, defined as:

$$P(v_i > 0) = \Phi(X_i \beta_1) \qquad (1)$$

$$E(v_i \mid v_i > 0) = X_i \beta_2. \qquad (2)$$

The first equation represents the probability of an establishment i having positive vacancies (or a positive vacancy rate since V > 0 and v > 0 are clearly synonymous). Given the binary nature of the dependent variable (either the establishment has a vacancy (=1) or it does not (=0)), we estimate this using a probit model which takes into account the dichotomous nature of the dependent variable (Φ is the CDF (cumulative density function, or distribution function) of the standard normal distribution). The second equation specifies a model for the conditional vacancy rate (i.e. conditional on having some vacancies, v > 0), and this is estimated using a truncated regression model given that only positive observations on v are observed[26]. If $\beta_1 = \beta_2$, then the model becomes the simple Tobit model. As seen above, given the differential impact of establishment size on the vacancy incidence (i.e. probability of having any vacancies) and on the vacancy intensity (i.e. vacancy rate), this restriction is not expected to hold. However, this restriction is formally tested in the analysis that

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[24] The original paper was Tobin (1958), although the Tobit ('Tobin's probit') is now a fairly standard econometric model since it can be seen to apply to a large variety of circumstances. For a discussion and some examples, see, for example, Amemiya (1986) and Greene (2000).

[25] The classical example in the literature, due to Lin and Schmidt (1984), is the 'loss due to fire' as a function of the 'age of the building'. Newer buildings typically have a lower probability of having fires, but have a greater average loss when a fire does occur.

[26] A special early example of this type of model presented by Dudley and Montmarquette (1976) analysed whether one (donor) country gives aid to another (recipient) country, and if so, how much it gives. They estimate the first equation by probit, and their second equation by OLS on the positive aid observations rather than using a truncated regression technique. This is consistent in their case because they assume that the probability of giving aid and the amount given are unrelated – that is the two equations are independent, although, as noted by Amemiya (1986), this assumption seems unrealistic despite the computational advantage that this brings. In the current context, assuming independence between the probability of positive vacancies and the value of the vacancy rate is inappropriate - indeed, many of the same factors are expected to be important in both equations, even if their magnitude (and sign) may differ between the two equations.

follows.

Since the primary interest is in the relative importance of the determinants of vacancy incidence and vacancy intensity, the marginal or partial effects for the regressors for both the probit and truncated regression results are reported. For the probit specification, these are the magnitude of the impact of the regressor on the probability of an establishment reporting any vacancies. For binary/dummy variables, since there cannot be a marginal change in, say, being in the private sector, the change in the probability of having any vacancies for the discrete change in the dummy variable from 0 to 1 (non-private to private sector) is therefore reported. In the truncated regression, the marginal effects represent the impact on the log vacancy rate and thus record the proportionate impact on the vacancy rate for a unit change in the independent variable[27].

Finally, in order to measure the overall impact of any particular variable X on the vacancy rate, its impact on vacancy incidence and vacancy intensity need to be combined. Simple differentiation yields:

$$\frac{\partial v}{\partial X} = \frac{\partial (P(v > 0) \times E(v \mid v > 0))}{\partial X} = \beta_1 \phi(X_1\beta_1) \times E(v \mid v > 0) + \beta_2 \times P(v > 0) \qquad (3)$$

where ϕ is the standard normal density function. These overall effects are also reported in the results in the following section.

4.   The Determinants of Vacancies

There are potentially a number of variables that may contribute to differences in the probability that an establishment has vacancies (i.e. vacancy incidence), and to differences in the vacancy rate at the establishment if there are some vacancies (i.e. vacancy intensity as measured by the conditional vacancy rate). However, no attempt is made to hypothesise which factors may influence only the vacancy incidence from those that may determine the vacancy intensity. Rather, a common vector of variables is specified for both the probit and the truncated regression part of the model. Given that in steady state, the vacancy rate is identically equal to the product of the vacancy inflow rate and the average vacancy duration, factors which affect either the number of vacancies or the duration of vacancies (or both) will impact on the measured vacancy rate. A brief description and summary statistics for the variables used in the empirical estimates is presented in Table A1.

4.1   Establishment and Firm Characteristics
The first specification (labelled specification A in the Table 8, Tables 9A and 9B and Table 10A and 10B) simply includes a number of controls for firm and establishment level characteristics. The first group of variables control for differences in establishment size. Rather than impose linearity, or any other functional form on the relationship between size and vacancy incidence and vacancy rates, eight grouped

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[27] The dependent variable in the truncated regression equation (2) is defined as log(1+v) in the empirical estimates presented below. This transformation reduces the skewness in the distribution of positive vacancy rates and ensures the continuity of the underlying latent variable (vacancy propensity) at v = 0. Of course, log(1+v)≈v for small v.

measures of establishment size (denoted est. size 5-9 through to est. size 500+, and defined as in the tables above) are included, with establishments which have 1-4 employees as the omitted (base) category. Given the figures presented in Tables 4, 5A and 5B, and 6A and 6B, and illustrated in Figures 9, 10A and 10B, and 11A and 11B respectively, the expectation is that vacancy incidence will increase and vacancy rates will decrease with increasing establishment size.

Secondly, a measure of the private/public status of the establishment is included. Clearly, rather different processes determine hiring and firing in the public and private sector, and thus a dummy variable denoting private sector establishments (private sector) will reveal what hiring and firing strategies have on vacancies - perhaps because of differences in vacancy durations between public and private sectors. Thirdly, a dummy variable is included for whether the firm is wholly or partly foreign owned (foreign owned). While this is represents a relatively small proportion of establishments in the population, it seems plausible that recruitment strategies may well differ for such firms.

Fourth, the variable single controls for whether the firm is a single or multiple establishment organisation. In multi-establishment organisations, while there may be a greater probability of having formal human-resource management arrangements which may facilitate recruitment, there may be greater coordination problems with constituent establishments regarding hiring and firing decisions. On similar grounds, a variable controlling for whether the establishment is the head office of the organisation is included (head office). Such establishments may have recruitment issues partly or largely unrelated to the operational side of the enterprise, and thus may demonstrate rather different patterns in vacancies.

To capture any expansionary or contractionary effects of the organisation on recruitment and replacement of unfilled positions, increase in sales and decrease in sales control for whether total sales (for private sector enterprises) or budget (for non-private sector establishments) has increased or decreased 'a great deal' in the past 12 months. Related to this are the controls for the establishments' underlying hiring and quit rates (hire rate and quit rate). These are measured as a proportion of the current workforce at the establishment who have been taken on or left in the preceding 12 months respectively[28].

Finally, measures of the amount of off-the-job training taking place at the establishment are included. Clearly, one response to vacancies, especially those which are hard-to-fill, and/or are the result of skills shortages, is for establishments to train their current workforce to fill these tasks. Their incumbent employees have the advantage of enterprise-specific knowledge which may make them good candidates to fill vacant positions. At the same time, establishments will engage in off-the-job-training for a wide variety of other purposes, including general upskilling of the workforce to meet increasing technical demands, for staff morale, etc. Three dummy variables for different proportions of staff which have engaged in off-the-job-training in the last 12 months are included: training 1-20%, training 20-80% and training 80-100%, with the base of no employees having received any off-the-job-training in the

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[28] There are a few implausible extreme observations on these variables given the size of the incumbent workforce, and hence observations with a hiring rate or quit rate of greater than 10 are discarded in the empirical estimates.

last 12 months.

4.2 Industry and Area Characteristics

The second and third specifications (labelled specifications B and C in Tables 8, 9A and 9B and 10A and 10B) include a number of industry and area characteristics that are likely to impinge on the probability of establishments to have vacancies, and on their vacancy rates. These are in addition to the firm and establishment level characteristics included in specification A. The first measure of industrial structure included captures the potential supply of labour to the establishment in the local area. This is measured as the proportion of the local labour force (at the LLSC level) which is currently employed in the industry in which the establishment is engaged (LLSC industry empl.). Clearly, the greater is the local supply of labour with the appropriate skills, the easier it should be for establishments to fill their current vacancies, although they will be competing against a greater number of other establishments for the same workers and hence the *demand* for these workers is also likely to be greater. The net balance of these two opposing effects is an empirical matter. The share of employment in the local area is obviously only one of a number of industry characteristics that may be relevant to the vacancy process. In particular, in growing or declining industries, there may be additional recruitment issues over and above those at the establishment or local level captured by the other variables included in the specification. Thus, the impact of including a set of 14 industry dummies is also investigated in specification C.

In addition to the industrial composition of the current local labour force, the proportionate rate of growth of the locally employed labour force (at the LLSC level) over the last two years is included (LLSC empl. growth). High rates of growth in employment may mean a relative shortage of excess labour to fill any vacancies. However, it may also signal to workers currently located outside the local area that it has good employment prospects, and hence they may be more tempted to migrate to the area. The net balance of these two effects is thus uncertain *a priori*. Two measures of the skills of the local labour force are also included. LLSC low skills is the proportion of the LLSC labour force which has no qualifications, while LLSC high skills is the proportion which has NVQ level 4 or above[29].

The next variable capturing the characteristics of the local labour force and their likely impact on vacancies is a measure of local relative wages. This is constructed from the (1-digit SOC90) relative wages in the LLSC area (relative to the average for England) taken from the NES. A weighted average of these relative wages is computed, with weights given by the shares of each of the 1-digit occupations in the local labour force taken from the LFS. Thus, rather than simply taking the average wage for all workers in the local area, this measure captures the extent to which the area has high or low wages relative to the occupational composition of the local labour force[30]. This difference will be more important the greater is the heterogeneity in the occupational distribution of employment at the LLSC level.

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[29] None of the substantive conclusions presented below are affected by including those with NVQ level 1 amongst the low skills category.
[30] That is, it takes account of the fact that average wages in, say, London are high in part because of the occupational composition of employment. Whether they are higher than that expected given the occupational composition is captured by the occupationally-weighted relative wage.

The final variables controlling for the local labour market conditions are two measures of New Deal activity at the LLSC level. The level of participation in New Deal activities (ND_participation) is computed as the number of New Deal participants in the LLSC area expressed as a fraction of total unemployment as at December 2000. The efficacy of the New Deal activities (ND_efficacy) is captured by the number of unsubsidised jobs gained as a proportion of New Deal participants at the LLSC level. Clearly, the greater the participation in New Deal activities, and the greater the effectiveness of these activities, the lower should be the rate of unemployment for any given level of vacancies. Hence these two variables should shift the UV curve inwards towards the origin.

The final variable is a measure of unemployment. In the results presented in detail, the unemployment measure selected is the LLSC ILO unemployment rate for all those aged 16 or over. However, a summary of the results for different measures of unemployment, such as the claimant count rate, and the non-employment rate is also presented.

4.3   Results for Vacancy Incidence and Vacancy Rates

The basic results are presented in Tables 8, 9A and 9B, and 10A and 10B for all vacancies, for hard-to-fill and non-hard-to-fill vacancies, and for skill-shortage and non-skill-shortage vacancies respectively. In each table, three empirical specifications (labelled A, B and C as discussed above) of the model in equations (1) and (2) are presented. First, there are the estimates of the probit equation (1) for the presence of any vacancies (Vacancy Incidence). This is followed by the truncated regression results for equation (2) (Vacancy Intensity) for the vacancy rates conditional on there being some vacancies. Finally, the joint marginal effects for changes in the independent variable on the vacancy rate across all establishments are reported as explained in the discussion surrounding equation (3)[31].

Table 8 for the determinants of all vacancies reveals a number of interesting patterns and findings. First, as had already been anticipated from the cross-tabulations in Table 4, the incidence of vacancies increases but the vacancy rate decreases with increasing establishment size. The net impact of increasing size on the overall vacancy rate is positive as can be seen in the final columns of the table which report the net marginal effects. The magnitudes of the marginal effects are quite large. For example, for specification (C), the impact of an establishment growing from being of average size (10 employees in the sample and thus in est. size 10-24) to being one standard deviation above the average size (which would place it in size category est. size 50-99) would be to increase the expected vacancy rate by (0.0480-0.0091=) 0.0389. Given that the average vacancy rate is 0.0423, this represents an increase of over 90% from the mean, or almost 30% of a standard deviation in the vacancy rate.

In contrast, the net impact on the vacancy rate of establishments being in the private sector, foreign or joint foreign/UK owned, or single establishment organisations are negligible. However, establishments which have increased their scale of operation in the last 12 months have vacancy rates over (0.0237/0.0423) 56% higher than

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[31] The restriction to the simple Tobit specification is rejected in favour of the two equation model as formulated by Cragg (and discussed in Section 3.3) for all of the specifications considered in the report.

establishments which have seen little or no change in turnover or budget. Establishments that are contracting have slightly lower vacancy rates.

Where hiring rates and quitting rates are higher, vacancies are more prevalent as is expected. To gauge the magnitude of the impact of changes in these continuous variables, it is helpful to consider a representative change in the variable. Thus if an establishment has a hiring rate one standard deviation above the mean hiring rate, the impact on the expected vacancy rate will be ($0.7082 \times 0.0116 =$) 0.008 which is small compared to the standard deviation of the vacancy rate (0.1347). Thus while these variables have their expected signs, their impact on actual vacancy rates would appear to be negligible.

Establishments which engage in more off-the-job-training of their workers have higher vacancy rates. There are a number of plausible explanations for this finding. The organisation may be engaged in activities which are increasingly technologically advanced and therefore need to recruit more staff with these skills as well as upgrading the skills of the incumbent workers. Alternatively, anticipating future demands and scale may induce firms to train their existing workers as well as attempting to recruit more workers. In any event, those establishments engaged in the most training (80-100% of employees receiving off-the-job-training in the previous 12 months) do not appear to be satisfying their requirements for more workers purely from within their own organisation since these have significantly higher vacancy rates.

Turning to the industry and area characteristics, it can be seen that establishments located in areas of low skills amongst the labour force tend to have significantly more vacancies, *ceteris paribus*. However, the size of this effect is again very small. For specification C, a one standard deviation increase in the proportion of the working age population with no qualifications would increase the vacancy rate by ($0.0377 \times 0.1561 =$) 0.006, which is negligible compared to the variation in the vacancy rate. Similarly, while areas of strong employment growth tend to have more vacancies, consistent with the pro-cyclicality of vacancies at the aggregate level, the magnitude of the effect is small.

Where there are a large number of New Deal participants as a share of unemployment, vacancy incidence and vacancy rates are significantly higher. This may be a reflection of the characteristics of the stock of unemployed in that the higher the proportion of New Deal participation, the longer will be the average duration of the unemployed due to the eligibility criteria for New Deal participation. Long duration unemployment spells are associated with greater 'scarring' effects whereby the skills of the unemployed are denuded from a lack of use/update and, in addition, employers are increasingly unwilling to employ such individuals perhaps due to the adverse 'signal' that is engendered by a long period without employment. Whatever the explanation, establishments located in areas with more New Deal participants as a share of unemployment are more likely to have vacancies. In terms of policy, this indicates that New Deal participants are not gaining employment despite job opportunities being available. This confirms the conclusion from the case studies report which finds that, amongst the small number of employers who had employed staff through the New Deal, the general impression was that the New Deal participants were not always well-suited to the jobs on offer. This mismatch was

exacerbated by some problems associated with the administration required to obtain New Deal placements.

Finally, the coefficient on the (log) ILO unemployment rate is negative and significant for both the incidence of vacancies and for the vacancy rate. Its net impact on the overall vacancy rate is thus definitely negative, consistent with the UV or matching models of the relationship between vacancies and unemployment. However, once again, for reasonable/typical values of differences in the unemployment rate between LLSCs (which varies between 2.2% (in Hertfordshire LLSC) and 9.2% (in Birmingham and Solihull LLSC) at the time of the survey), while establishments in LLSCs with high unemployment on average tend to have fewer vacancies and *vice versa*, differences in the expected vacancy rate are small when compared to the overall variation in the vacancy rate. That is, once the other differences between establishments have been taken into account, the difference in the expected vacancy rate between two identical establishments located in the LLSCs with the highest and lowest unemployment rates is much less than the variation in vacancy rates that remains between two identical establishments within the same LLSC area.

Table 9A and 9B and Table 10A and 10B repeat the analysis in Table 8 for hard-to-fill and non-hard-to-fill, and skill-shortage and non-skill-shortage vacancies respectively. Notable differences from the results in Table 8 include the finding that areas which have experienced recent employment growth tend to have a lower hard-to-fill vacancy rate and skill-shortage vacancy rates, despite having higher non-hard-to-fill, and non-skill-shortage vacancy rates. It could be argued that these establishments seem to benefit from an expanding local labour force providing suitable workers for hard-to-fill and skill-shortage vacancies, even though overall vacancy rates are higher, perhaps reflecting greater job turnover in these areas and continued expansion. Furthermore, the impact of the skills of the local labour force on the number of skill-shortage vacancies in particular seems rather perverse, although the results are weak statistically which probably reflects the small number of vacancies of this type – the mean vacancy rate (by employment) is only 0.5%, and only 3.7% of all establishments have any vacancies of this type.

With the exception of the hard-to-fill vacancy rate, the incidence and intensity of all four subcategories of vacancies are significantly negatively related to the local unemployment rate, although the marginal effects are greater for the non-hard-to-fill and non-skill-shortage incidence than for their complements. That is, for any given fall (increase) in LLSC unemployment, the establishment vacancy propensity for non-hard-to-fill and non-skill-shortage vacancies increases (falls) by more than for hard-to-fill and skills-shortage vacancies. This is consistent with the notion that these vacancies are more associated with normal turnover/replacement than, for example, skill-shortage vacancies which are much less sensitive to changes in the unemployment rate. However, as for total vacancies, the marginal effects on the vacancy rate are rather small.

One overall conclusion from these estimates is that, despite their statistical significance, the marginal effects of the independent variables on the vacancy are rather small. That is, conditional on establishment size, establishments' vacancy rates are extremely variable. Thus, while it is possible to identify factors which are significantly correlated with both vacancy incidence and vacancy rates, in general

there is considerable variation in vacancy rates between establishments which cannot be explained. This interpretation is consistent with the variance decomposition in Tables 7A and 7B which suggested that most of the variation in both unconditional and conditional vacancy rates was within rather than between the categories examined in the table. The conclusions for the establishment level analysis conducted in this section are similar. Even controlling for a large number of potential factors which can plausibly affect the vacancy rate, vacancy rates are still extremely dissimilar between otherwise similar establishments. The factors which are identified as important can only account for a small proportion of the variation in establishment-level vacancy rates. This highlights the importance of the more detailed case studies reported in Hogarth *et al* (2002) which can directly investigate the intra-establishment variation in vacancies within LLSC areas.

4.4   Alternative Measures of the Local Unemployment Rate

The results from the previous sub-section reveal that it is possible to discern a significantly negatively sloped relationship at the establishment level between vacancies and local unemployment once the other influences on vacancy incidence and conditional vacancy rates are taken into account. That is, there would appear to be a downward-sloping local UV curve. Of course, as Green and Owen (2002) note, their bivariate comparison fails to take account of the myriad of other factors that impinge on the UV relationship. Thus one plausible explanation for the difference between the results presented above and those in Green and Owen (2002) is that the local UV curve is obscured at the LLSC area level by the differences between establishments across the LLSCs which this report explicitly incorporates but which are averaged out across the establishments within each LLSC in the Green and Owen (2002) LLSC-area level analysis.

Hence local labour markets do appear to operate, at least in aggregate, according to expectations, such that where labour is in relatively short supply (unemployment is low), establishments tend to have more vacancies while where there is an abundance of workers looking for jobs (unemployment is high), then firms tend to fill their vacancies quickly, and thus have lower vacancy intensities. Of course, this general conclusion does not preclude the existence of areas which, for whatever reasons, may 'buck the trend'. However, these are the exceptions to the general rule.

In order to investigate the robustness of this finding, Table 11 presents a summary of the estimates obtained for different measures of the unemployment rate. For comparative purposes, the first row of the table repeats the results for the coefficients and their standard errors obtained in the previous sub-section for specification C, for each of the five categories of vacancies. These results are thus for the LLSC ILO unemployment rate.

The remaining rows present the coefficients on the log unemployment variable for three alternative measures of the unemployment rate[32]. For all four 'unemployment' measures, both the incidence and intensity of total vacancies at the establishment level are negatively and significantly related to the LLSC unemployment rate. For hard-to-fill and non-hard-to-fill vacancies, the incidence of vacancies is consistently

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[32] These are: the claimant count rate (urate); the long-term unemployment rate (claimants who have been unemployed in excess of 6 months - lturate); and the non-employment rate (nonempr).

significantly related to all four of the unemployment measures. However, for the vacancy rates, the results are less robust. For skill-shortage vacancies, the coefficients on the unemployment measures are mainly negative, but only half are significantly so. Finally, for non-skill-shortage vacancies, vacancy incidence is strongly negatively related to whatever measure of unemployment is utilised, while the conditional rate is also significantly negatively related to the unemployment measures, although the effects are less robust. However, in general, it is clear that there exists a negatively sloped UV curve at the establishment level.

4.5   UV Curves for the Classification of LLSCs by Green and Owen (2002)

In their spatial analysis of vacancies and local unemployment, Green and Owen (2002) develop a typology of LLSCs according to their relative vacancy incidence and density rates and relative unemployment rates. This classification into four groups of LLSCs is depicted in Annex C, Table C1. Of these four groups, it is Group A LLSCs with both high vacancies and high unemployment that are of most concern, although in terms of a conventional UV relationship, Group C with both low vacancies and low unemployment also present rather a paradoxical result.

Table 12 presents a summary of estimates for specification C for which the coefficient on the unemployment rate[33] differs according to the Green and Owen (2002) classification of LLSCs. That is, the slope of the UV curve is allowed to differ between the groups, while simultaneously still controlling for the other factors that have been seen to affect the vacancy incidence and conditional vacancy rate. As can be seen from the first column, the magnitude of the slope of the UV curve is smaller for Group A LLSCs, for both vacancy incidence and vacancy intensity. However, the UV curve is still negatively sloped in general whether defined in terms of vacancy incidence or conditional vacancy rates, and is also negatively sloped for all sub-categories of vacancies too as seen in the remaining columns of Table 12. Thus while the relationship for Group A LLSCs is less steep than for the other LLSCs, which suggests that vacancies are less responsive to changes in the unemployment rate in these LLSCs relative to the other Groups, it still displays the conventional negative slope once the other factors which affect vacancies have been taken into account[34]. All other LLSCs also have negatively sloped UV curves.

As can be seen in the remaining columns of Table 12, the UV relationship is weakest for Group A LLSCs relative to the other LLSCs for the hard-to-fill and skill-shortage categories, while it is much more similar to the other LLSCs for non-hard-to-fill and non-skill-shortage vacancies. Given that Green and Owen (2002) exclusively focus on hard-to-fill and skill-shortage vacancies, then their failure to uncover a significantly negatively sloped UV relationship - and their identification of an apparent paradox of high vacancies and high unemployment in Group A LLSCs - is perhaps not surprising. These are precisely the types of vacancies and the LLSCs that come closest to not revealing the expected inverse relationship between vacancies and local unemployment. However, the analysis in this report reveals that once the other

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[33] Here taken as the ILO unemployment rate although the results are similar for the other measures of unemployment.
[34] This may be seen as a positive attribute, in that when unemployment increases *ceteris paribus*, Group A LLSCs do not see such large decreases in their vacancy intensity (although, of course when unemployment falls, vacancies do not increase by as much here as in other areas).

differences between establishments and LLSCs which affect the UV curve have been taken into account, then there is a strong, negative correlation between all vacancy rates and local unemployment rates, for all LLSCs. Thus the findings in this report are consistent with the concept of a UV/Beveridge curve.

5.   Conclusions

At the aggregate – economy-wide - level, there is a strong negative relationship between vacancies and the unemployment rate. This is clearly illustrated in Figure 12 for time-series data for the UK for the last decade. As unemployment rose in the early 1990s and then fell, the stock of vacancies[35] correspondingly fell and then rose strongly. This is the evidence that underlies the standard aggregate UV/Beveridge curve. As reported in Section 2 of this report, the existence of a negative relationship between vacancies and unemployment has received considerable empirical support both over time and across space, including at the local area level for the UK as reported in Coles and Smith (1996) and Bennet and Pinto (1994) amongst others.

The first major finding of this report is that a statistically significant negatively-sloped local UV curve can be identified at the establishment level. This relationship exists for total vacancies, and also for the differing subsets of vacancies in general, although it is weaker for hard-to-fill and for skill-shortage vacancies in particular. This result also accords with our expectations since these are exactly the types of vacancies that the unemployed are least likely to be qualified for and thus least able to fill. In this sense, there is evidence of skills mismatch between the unemployed and these vacancies. However, skill-shortage vacancies are few in number: as shown in Section 3 above, they are only 1 in 5 of all vacancies; they comprise only 0.5% of all jobs; and only 3.7% of establishments have any such vacancies available. The negatively-sloped UV curve is statistically strongest and the slope of the relationship is greatest in magnitude for non-skill-shortage vacancies. These comprise the majority of vacancies as noted above and perhaps most closely accord with (frictional/normal) labour turnover. Local labour markets thus seem to operate in the manner predicted by standard models of the matching process between unemployment and vacancies, even in a period of (close to) full-employment.

The second principal conclusion of this report is that there is considerable variation in the distribution of vacancies. While a large number of firm, establishment and local area characteristics can be identified which are significantly associated with higher levels of vacancies, much of the variation in vacancies between establishments remains 'unexplained'. One interpretation is that this is due to unobserved heterogeneity – that is, systematic differences between establishments which are not recorded in the data but are correlated with vacancy incidence and intensity. However, a more identifiable and plausible explanation is that it is the heterogeneity in the stock of vacancies that underlies the remaining differences in vacancy incidence and intensity. To illustrate this point, aggregate monthly vacancy inflows (i.e. jobs offered) and outflows (i.e. jobs filled) together with the aggregate vacancy

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[35] These are the Employment Service statistics on vacancies as notified to Job Centres. As noted above, occasional surveys have indicated that approximately one-third of all vacancies nationally are recorded in this manner. This aggregate series is therefore useful in the analysis of trends in vacancies even though it grossly underestimates the actual number of vacancies available. For comparison, the estimated total number of vacancies from ESS2001 (i.e. for England) for spring 2001 is 766,000.

stock (i.e. jobs currently available) are depicted in Figure 13. This reveals that the vacancy inflow has been marginally greater than the outflow throughout much of the 1990s, and thus there has been a slight but systematic rise in the aggregate stock of vacancies over the period. More importantly, Figure 13 also shows that the flows onto and off the vacancy 'register' are of the same order of magnitude as the total stock of vacancies. Thus, at any point in time, considerable turnover is taking place in employment. This high level of turnover in the aggregate job market is also a general feature at the establishment level, so that even if an establishment has no vacancies on one particular day (say, the day it is surveyed in ESS2001), it may have had vacancies the day before, or may have vacancies the day after. It is this 'random' variation related to job turnover (i.e. the flow of vacancies) which probably accounts for much of the 'unexplained' variation in the stock of vacancies. Hence, while it is possible to identify factors which are correlated with both vacancy incidence and vacancy intensity, in general there is considerable variation in the vacancy stock between establishments which cannot be accounted for.

This interpretation of the results is consistent with the variance decomposition in Table 7A and Table 7B which suggests that most of the variation in both unconditional and conditional vacancy rates is within rather than between the categories examined. The conclusions for the establishment level analysis are similar. Even controlling for a large number of potential factors which can plausibly affect the vacancy rate, vacancy rates are still quite dissimilar between otherwise similar establishments. The factors which are identified as important can only account for a small proportion of the variation in vacancy rates between establishments at any point in time.

The graphical and statistical analysis of the ESS2001 data presented by Green and Owen (2002) reveals an inverse relationship between vacancies and unemployment at the LLSC area level, but, in contrast to the results presented in this report, in general the relationship is not statistically significant. Indeed, Green and Owen (2002) highlight some seemingly perverse LLSCs with both high unemployment and high vacancies and suggest that these LLSCs merit further consideration since they do not conform to a conventional UV/Beveridge curve relationship. As a consequence, three of these apparently 'paradoxical' LLSCs[36] are chosen as the location for the *ELASU* case studies in order that further analysis can be made of the underlying processes which give rise to the employment relationships in these localities (Hogarth *et al*, 2002).

How can the results of Green and Owen (2002) and those presented in this report be reconciled? There are at least two plausible explanations for the differences observed. Firstly, averaging out the variation in vacancies within LLSCs for the LLSC-level analysis may serve to obscure the underlying UV relationship. As shown in Table 7A and Table 7B, most of the variation in vacancies is within rather than between LLSCs, and thus this averaging process eliminates most of the variation in vacancies that is of interest. Secondly, since the bivariate analysis does not take into account the other factors which differ systematically between LLSCs and affect both vacancies and unemployment, this may result in a biased estimate of the UV relationship at the LLSC level. As the empirical results presented in this report reveal,

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[36] Namely Birmingham and Solihull LSC, East London LSC and Lancashire LSC.

firm, establishment, industry and local labour market characteristics are all systematically related to vacancy incidence and vacancy intensity. Differences in vacancy incidence and intensity by establishment size are particularly notable, for example, and these differ across LLSCs due, in part, to differences in the sectoral distribution of employment.

In conclusion, the major finding which results from the analysis in this report is the existence of a strong, statistically significant, negative relationship between establishment-level vacancies and local unemployment when the factors which are systematically related to vacancies and unemployment are taken into account. This result is consistent with much of the previous aggregate and disaggregate time-series and cross-section evidence, and indicates that local labour markets are operating in the manner suggested by conventional UV/Beveridge curve analysis. Thus, despite the fact that some LLSCs have relatively high vacancy and unemployment rates (i.e. LLSCs in Group A), the labour market still seems to be operating in the expected manner in that vacancies and unemployment are inversely related. Vacancies and unemployment are greater in some areas than others due to their sectoral employment distribution and also perhaps their unemployment composition. There is, of course, some variation in the magnitude and statistical strength of the responsiveness of vacancies to changes in unemployment across LLSCs (and most probably across other dimensions such as industry for example). But, on average, measured across all LLSCs, and also even within the four groups of LLSCs identified by Green and Owen (2002), the empirical specification clearly reveals that vacancies are higher where unemployment is lower and *vice versa*.

From a policy perspective, that there is strong evidence for a local UV curve does not negate the role of institutions designed to facilitate the operation and functioning of labour markets. Rather, the results in this report indicate that differences in vacancies and local unemployment rates are more a consequence of the composition of employment - and unemployment - in the local labour market than any systematic failure of the local labour market to operate and adjust in the expected manner.

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Table 1

Population Distribution of Establishments and Employment

establishment size	Establishments		Employment		Sample	
	number	percent	number	percent	observations	percent
1-4	1,481,191	71.95	2,233,845	10.85	3,701	13.69
5-9	227,664	11.06	1,473,334	7.16	3,676	13.60
10-24	203,044	9.86	3,105,347	15.09	5,090	18.83
25-49	75,978	3.69	2,577,550	12.52	6,151	22.76
50-99	41,507	2.02	2,714,846	13.19	3,306	12.23
100-199	15,493	0.75	2,064,570	10.03	2,605	9.64
200-499	10,928	0.53	3,223,543	15.66	1,799	6.66
500+	2,909	0.14	3,191,056	15.50	703	2.60
Total	2,058,714	100.00	20,584,090	100.00	27,031	100.00

Table 2A

Vacancy Incidence: Percentage Reporting Vacancies by Establishment

	Vacancy Incidence by Establishment					
	any vacancies	any h2f vacancies	any nh2f vacancies	any ss vacancies	any nss vacancies	column%
Panel A: Aggregate						
Total	14.5	7.5	8.3	3.7	11.9	100.00
Panel B: by Region						
Eastern	17.3	8.2	10.2	4.8	13.1	11.35
East Midlands	13.3	4.8	9.3	2.2	11.6	7.85
London	15.9	8.2	10.0	4.4	14.3	18.56
North-East	12.1	6.1	6.9	3.1	9.6	3.50
North-West	12.0	6.6	6.3	3.6	9.1	11.95
South-East	15.2	9.0	8.0	3.8	12.7	17.81
South-West	15.0	7.8	8.0	4.2	11.3	10.50
West Midlands	15.9	8.9	7.9	3.4	13.0	9.75
Yorks & Humberside	10.1	4.4	6.5	2.2	8.5	8.72
Total	14.5	7.5	8.3	3.7	11.9	100.00
Panel C: by Industry						
1.agriculture	7.0	5.0	2.4	1.3	5.8	2.97
2. mining & quarrying	2.7	1.9	2.0	0.2	2.5	0.16
3. manufacturing	14.4	6.8	9.1	3.9	11.7	8.85
4. elect'y & water supply	21.5	9.0	14.7	7.5	16.2	0.09
5. construction	9.0	5.6	3.8	3.6	5.7	9.16
6. wholesale, retail	13.7	6.0	8.2	2.5	11.5	23.32
7. hotels and restaurants	15.5	8.4	8.5	3.0	13.2	7.00
8. transport & comm.	16.3	8.2	9.4	4.0	12.7	4.45
9. finance	21.1	8.1	13.9	3.8	17.9	2.13
10. business services	14.6	8.3	8.6	5.3	12.1	25.06
11. public administration	22.8	8.0	19.2	4.1	21.0	1.00
12. education	26.5	15.2	15.1	4.8	23.3	2.28
13. health & social work	25.0	13.0	14.3	4.5	21.6	4.37
14. other community	12.6	6.8	6.3	3.0	10.0	9.18
Total	14.5	7.5	8.3	3.7	11.9	100.00
Panel D: by Sector						
Private sector	13.9	7.3	7.6	3.6	11.2	85.70
Public sector	19.7	8.4	13.1	3.2	17.3	8.85
Voluntary sector	16.7	9.1	13.3	6.4	15.4	4.72
Total	14.5	7.5	8.3	3.7	11.9	100.00
Panel E: by Est. Size						
1-4	9.7	5.2	5.2	2.9	7.7	71.95
5-9	16.3	8.4	8.8	3.5	13.4	11.06
10-24	26.4	13.7	14.7	5.9	21.6	9.86
25-49	36.1	17.3	23.3	7.3	31.3	3.69
50-99	47.8	24.2	31.0	10.8	41.3	2.02
100-199	55.4	25.2	41.4	11.7	49.8	0.75
200-499	63.6	27.4	52.3	13.3	59.0	0.53
500+	70.5	35.0	59.2	17.5	65.1	0.14
Total	14.5	7.5	8.3	3.7	11.9	100.00

Notes:
1. All statistics are weighted by establishment. See text for details.

Table 2B

Vacancy Incidence: Percentage Reporting Vacancies by Employment

	Vacancy Incidence by Employment					
	any vacancies	any h2f vacancies	any nh2f vacancies	any ss vacancies	any nss vacancies	column%
Panel A: Aggregate						
Total	44.2	22.1	32.5	10.7	39.3	100.0
Panel B: by Region						
Eastern	45.3	26.6	30.3	10.6	39.1	10.44
East Midlands	40.3	18.9	31.1	9.6	36.1	7.99
London	48.1	22.3	37.8	12.5	43.6	17.86
North-East	40.2	18.4	29.4	9.1	35.1	4.56
North-West	39.3	17.9	31.2	10.1	35.8	12.94
South-East	49.2	27.8	33.1	11.8	43.3	16.32
South-West	46.3	23.1	31.9	9.6	41.2	9.50
West Midlands	43.6	21.0	32.7	11.5	38.7	10.79
Yorks & Humberside	37.5	17.8	28.7	8.1	33.1	9.60
Total	44.2	22.1	32.5	10.7	39.3	100.0
Panel C: by Industry						
1.agriculture	21.3	10.0	13.7	3.5	18.6	1.15
2. mining & quarrying	23.9	20.8	8.4	1.6	22.3	0.23
3. manufacturing	39.8	19.2	29.8	10.6	34.4	17.33
4. elect'y & water supply	65.0	24.0	57.4	21.0	60.5	0.34
5. construction	27.7	16.4	15.1	9.8	20.2	4.26
6. wholesale, retail	36.5	14.2	27.3	5.5	33.1	17.54
7. hotels and restaurants	43.6	20.0	31.8	5.6	41.2	5.59
8. transport & comm.	51.2	23.4	39.8	10.3	47.4	5.89
9. finance	46.7	15.0	38.2	7.8	42.0	4.48
10. business services	44.9	23.0	31.7	14.7	37.7	15.04
11. public administration	57.2	29.5	48.6	17.8	53.7	5.73
12. education	50.3	28.9	34.2	9.7	45.5	7.33
13. health & social work	59.6	40.8	41.9	17.5	53.8	10.34
14. other community	37.0	15.1	27.5	6.7	33.6	4.75
Total	44.2	22.1	32.5	10.7	39.3	100.0
Panel D: by Sector						
Private sector	40.9	19.5	29.3	9.5	35.8	71.82
Public sector	54.0	30.0	42.2	14.3	49.9	24.51
Voluntary sector	45.5	23.9	32.5	9.7	41.0	2.99
Total	44.2	22.1	32.5	10.7	39.3	100.0
Panel E: by Est. Size						
1-4	10.4	5.5	5.6	2.9	8.3	10.85
5-9	16.9	8.6	9.2	3.6	13.9	7.16
10-24	27.5	14.3	15.3	6.0	22.7	15.09
25-49	36.5	17.6	23.6	7.5	31.7	12.52
50-99	48.2	24.6	31.4	11.2	41.5	13.19
100-199	56.1	25.1	42.4	11.7	50.6	10.03
200-499	64.2	27.6	53.3	13.2	59.8	15.66
500+	71.4	41.8	59.5	22.9	65.3	15.50
Total	44.2	22.1	32.5	10.7	39.3	100.00

Notes:
1. All statistics are weighted by employment. See text for details.

Table 3A

Vacancy Rates by Establishment

	Vacancy Rate by Establishment					
	total vacancies	h2f vacancies	non-h2f vacancies	ss vacancies	non-ss vacancies	column%
Panel A: Aggregate						
Total	4.2	2.1	2.1	1.0	3.2	100.00
Panel B: by Region						
Eastern	5.6	2.3	3.3	1.7	3.9	11.35
East Midlands	3.6	1.1	2.4	0.5	3.1	7.85
London	5.7	2.8	2.9	1.1	4.6	18.57
North-East	2.7	1.6	1.1	0.9	1.8	3.50
North-West	3.2	1.9	1.3	1.2	2.0	11.96
South-East	4.0	2.2	1.8	0.8	3.2	17.81
South-West	4.1	2.2	1.9	1.5	2.6	10.50
West Midlands	4.6	2.7	1.9	0.9	3.7	9.75
Yorks & Humberside	2.3	1.0	1.2	0.5	1.7	8.72
Total	4.2	2.1	2.1	1.0	3.2	100.00
Panel C: by Industry						
1.agriculture	2.2	1.9	0.3	0.3	1.8	2.97
2. mining & quarrying	0.2	0.1	0.1	0.0	0.2	0.16
3. manufacturing	3.1	1.1	2.0	0.7	2.3	8.85
4. elect'y & water supply	1.9	0.8	1.1	0.7	1.2	0.09
5. construction	3.2	2.0	1.2	1.4	1.8	9.16
6. wholesale, retail	4.3	1.8	2.5	0.6	3.7	23.32
7. hotels and restaurants	3.4	2.1	1.3	0.8	2.6	7.00
8. transport & comm.	5.2	2.0	3.1	1.0	4.2	4.45
9. finance	5.7	2.5	3.2	1.2	4.4	2.13
10. business services	5.5	3.0	2.5	1.7	3.8	25.06
11. public administration	1.8	0.4	1.4	0.2	1.6	1.00
12. education	2.6	1.3	1.3	0.3	2.3	2.28
13. health & social work	4.4	2.2	2.2	0.9	3.4	4.37
14. other community	4.0	2.2	1.8	1.1	3.0	9.18
Total	4.2	2.1	2.1	1.0	3.2	100.00
Panel D: by Sector						
Private sector	4.2	2.2	2.0	1.1	3.1	85.70
Public sector	3.4	1.1	2.3	0.5	3.0	8.85
Voluntary sector	6.4	2.1	4.2	1.8	4.6	4.72
Total	4.2	2.1	2.1	1.0	3.2	100.00
Panel E: by Est. Size						
1-4	4.7	2.4	2.4	1.2	3.5	71.95
5-9	3.0	1.5	1.5	0.6	2.4	11.06
10-24	3.1	1.6	1.6	0.7	2.5	9.86
25-49	2.7	1.2	1.5	0.5	2.2	3.69
50-99	2.7	1.3	1.4	0.5	2.2	2.02
100-199	2.4	0.9	1.5	0.4	2.0	0.75
200-499	2.0	0.7	1.4	0.2	1.8	0.53
500+	2.1	0.7	1.4	0.3	1.8	0.14
Total	4.2	2.1	2.1	1.0	3.2	100.00

Notes:
1.   All statistics are weighted by establishment. See text for details.

34

Table 3B

Vacancy Rates by Employment

	Vacancy Rate by Employment					
	total vacancies	h2f vacancies	non-h2f vacancies	ss vacancies	non-ss vacancies	column %
Panel A: Aggregate						
Total	2.7	1.2	1.5	0.5	2.2	100.0
Panel B: by Region						
Eastern	3.1	1.6	1.5	0.7	2.4	10.48
East Midlands	2.2	0.8	1.4	0.3	1.9	7.99
London	3.2	1.3	1.9	0.6	2.6	17.89
North-East	1.9	0.7	1.2	0.3	1.5	4.56
North-West	2.1	0.9	1.2	0.4	1.7	12.95
South-East	3.5	1.8	1.7	0.7	2.8	16.25
South-West	2.8	1.4	1.5	0.5	2.3	9.51
West Midlands	2.4	1.0	1.3	0.5	1.9	10.77
Yorks & Humberside	1.8	0.7	1.1	0.3	1.6	9.59
Total	2.7	1.2	1.5	0.5	2.2	100.0
Panel C: by Industry						
1.agriculture	2.8	1.8	1.0	0.4	2.4	1.15
2. mining & quarrying	1.0	0.2	0.7	0.0	1.0	0.23
3. manufacturing	1.7	0.7	1.0	0.4	1.3	17.33
4. elect'y & water supply	2.0	0.7	1.3	0.5	1.5	0.34
5. construction	2.7	1.6	1.1	1.0	1.7	4.26
6. wholesale, retail	2.5	1.0	1.5	0.4	2.1	17.54
7. hotels and restaurants	4.1	1.8	2.4	0.4	3.7	5.59
8. transport & comm.	3.0	1.4	1.7	0.5	2.6	5.89
9. finance	2.5	0.8	1.7	0.4	2.1	4.48
10. business services	3.7	1.8	2.0	0.9	2.8	15.04
11. public administration	2.1	0.6	1.5	0.2	1.8	5.73
12. education	1.8	0.9	1.0	0.3	1.5	7.33
13. health & social work	3.2	1.7	1.5	0.6	2.6	10.34
14. other community	3.2	1.4	1.8	0.6	2.6	4.75
Total	2.7	1.2	1.5	0.5	2.2	100.0
Panel D: by Sector						
Private sector	2.8	1.3	1.5	0.6	2.2	71.82
Public sector	2.2	0.9	1.3	0.3	1.9	24.51
Voluntary sector	4.1	1.7	2.4	0.7	3.4	2.99
Total	2.7	1.2	1.5	0.5	2.2	100.0
Panel E: by Est. Size						
1-4	4.5	2.2	2.2	1.1	3.4	10.85
5-9	3.0	1.5	1.5	0.6	2.4	7.16
10-24	3.1	1.5	1.5	0.6	2.5	15.09
25-49	2.6	1.2	1.5	0.4	2.2	12.52
50-99	2.7	1.3	1.3	0.5	2.1	13.19
100-199	2.4	0.9	1.5	0.4	2.0	10.03
200-499	2.0	0.7	1.3	0.2	1.8	15.66
500+	1.9	0.7	1.2	0.3	1.6	15.50
Total	2.7	1.2	1.5	0.5	2.2	100.00

Notes:
1. All statistics are weighted by employment. See text for details.

Table 4

Vacancy Frequencies and Vacancy Rates by Establishment Size: Any Vacancies

| | Establishment Size | | | | | | | | |
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All %
number of vacancies:									
none	90.31	83.65	73.61	63.92	52.20	44.64	36.44	29.45	85.47
1	6.22	10.42	11.84	11.84	10.29	6.81	3.92	1.01	7.51
2	2.08	4.42	8.32	10.60	11.82	8.85	6.64	2.67	3.54
3	0.86	0.87	3.15	5.33	7.21	7.85	5.41	2.50	1.46
4	0.39	0.26	1.16	3.33	5.47	6.13	5.15	2.41	0.73
5 to 9	0.10	0.25	1.40	3.56	8.94	15.42	17.89	11.27	0.77
10 or more	0.04	0.14	0.52	1.42	4.07	10.32	24.54	50.69	0.51
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage reporting some vacancies	9.7	16.3	26.4	36.1	47.8	55.4	63.5	70.5	14.5
Mean number of vacancies for those with some vacancies	1.59	1.65	2.35	2.91	4.14	6.51	10.0	31.9	2.57
Mean vacancy rate for those with some vacancies	48.8	18.3	11.9	7.4	5.6	4.3	3.2	2.9	29.1
Mean overall vacancy rate	4.7	3.0	3.1	2.7	2.7	2.4	2.0	2.1	4.2

Notes:
1.   All statistics are weighted by establishment. See text for details.

Table 5A

Vacancy Frequencies and Vacancy Rates by Establishment Size:
Any Hard-to-Fill Vacancies

| | Establishment Size | | | | | | | | |
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All %
number of vacancies:									
none	94.85	91.64	86.29	82.68	75.79	74.82	72.65	64.96	92.50
1	3.52	5.60	6.63	7.09	7.09	6.29	6.73	3.82	4.30
2	0.93	1.92	4.07	4.34	5.70	4.76	4.65	2.56	1.62
3	0.25	0.46	1.44	2.34	2.63	3.26	2.69	2.17	0.55
4	0.39	0.17	0.63	1.29	2.31	2.32	1.88	1.09	0.48
5 to 9	0.07	0.15	0.63	1.51	3.99	5.33	4.35	5.86	0.33
10 or more	0.00	0.07	0.31	0.75	2.48	3.22	7.06	19.54	0.21
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage reporting some hard-to-fill (h2f) vacancies	5.2	8.4	13.7	17.3	24.2	25.2	27.4	35.0	7.5
Mean number h2f vacancies for those with some h2f vacancies	1.56	1.60	2.18	2.64	4.14	5.42	7.99	24.1	2.31
Mean h2f vacancy rate for those with some h2f vacancies	46.1	18.0	11.5	6.8	5.5	3.5	2.5	2.0	28.2
Mean overall hard-to-fill vacancy rate	2.4	1.5	1.6	1.2	1.3	0.9	0.7	0.7	2.1

Notes:
1.   All statistics are weighted by establishment. See text for details.

Table 5B

Vacancy Frequencies and Vacancy Rates by Establishment Size:
Any Non-Hard-to-Fill Vacancies

| | Establishment Size | | | | | | | | |
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All %
number of vacancies:									
none	94.76	91.81	85.33	76.64	69.01	58.58	47.70	40.76	91.65
1	3.68	6.23	7.86	9.75	9.44	6.76	4.24	0.90	4.73
2	1.23	1.96	4.29	6.87	8.72	8.45	7.49	4.37	2.06
3	0.27	0.35	1.25	2.83	4.94	5.81	5.67	2.31	0.64
4	0.00	0.13	0.45	1.53	2.47	4.99	4.58	2.27	0.23
5 to 9	0.06	0.14	0.64	1.73	4.03	9.62	14.37	10.65	0.43
10 or more	0.01	0.01	0.19	0.56	1.39	5.79	15.95	38.73	0.26
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage reporting some non-hard-to-fill (h2f) vacancies	5.2	8.8	14.7	23.3	31.0	41.4	52.3	59.2	8.3
Mean no. non-h2f vacancies for those with some non-h2f vacs.	1.42	1.54	2.19	2.55	3.15	5.40	8.01	23.7	2.40
Mean non-h2f vacancy rate for those with some non-h2f vacs.	45.0	16.9	10.6	6.4	4.4	3.6	2.6	2.3	25.4
Mean overall non-hard-to-fill vacancy rate	2.4	1.5	1.6	1.5	1.4	1.5	1.4	1.4	2.1

Notes:
1.   All statistics are weighted by establishment. See text for details.

Table 6A

Vacancy Frequencies and Vacancy Rates by Establishment Size:
Any Skill-Shortage Vacancies

| | Establishment Size | | | | | | | | |
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All %
number of vacancies:									
none	97.12	96.46	94.11	92.69	89.23	88.34	86.73	82.45	96.29
1	1.93	2.62	2.88	3.43	3.67	3.36	3.85	1.86	2.21
2	0.67	0.69	1.91	1.75	2.53	2.26	2.49	1.30	0.89
3	0.21	0.11	0.46	1.09	1.02	1.34	1.17	0.62	0.28
4	0.01	0.09	0.29	0.25	1.02	1.02	0.94	0.95	0.09
5 to 9	0.07	0.03	0.23	0.53	1.68	2.14	1.84	2.85	0.16
10 or more	0.00	0.00	0.12	0.26	0.84	1.54	2.98	9.97	0.08
total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage reporting some skill-shortage (ss) vacancies	2.9	3.5	5.9	7.3	10.8	11.7	13.3	17.5	3.7
Mean number ss vacancies for those with some ss vacancies	1.47	1.39	2.05	2.35	3.52	6.32	5.72	21.9	2.07
Mean ss vacancy rate for those with some ss vacancies	42.7	16.7	11.1	6.2	4.7	3.7	1.8	1.7	28.2
Mean overall skill-shortage vacancy rate	1.2	0.6	0.7	0.5	0.5	0.4	0.2	0.3	1.0

Notes:
1. All statistics are weighted by establishment. See text for details.

Table 6B

Vacancy Frequencies and Vacancy Rates by Establishment Size:
Any Non-Skill-Shortage Vacancies

| | Establishment Size | | | | | | | | |
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All %
number of vacancies:									
none	92.29	86.64	78.39	68.73	58.72	50.21	40.98	34.87	88.08
1	5.10	8.74	10.43	11.29	10.28	7.11	3.81	0.85	6.36
2	2.17	3.40	6.31	9.24	10.29	9.22	6.92	3.59	3.22
3	0.29	0.68	2.46	4.20	6.61	6.79	5.79	2.14	0.90
4	0.08	0.21	0.81	2.58	4.15	5.33	5.05	2.35	0.41
5 to 9	0.03	0.23	1.21	2.84	6.94	13.15	16.67	10.67	0.62
10 or more	0.04	0.10	0.39	1.11	3.01	8.18	20.78	45.54	0.42
total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Percentage reporting some non-skill-shortage (nss) vacancies	7.7	13.4	21.6	31.3	41.3	49.8	59.0	65.1	11.9
Mean number nss vacancies for those with some nss vacs.	1.45	1.65	2.32	2.81	3.87	5.76	9.51	28.65	2.49
Mean nss vacancy rate for those with some nss vacancies	45.4	18.0	11.5	7.1	5.3	3.9	3.0	2.7	26.7
Mean overall non-skill-shortage vacancy rate	3.5	2.4	2.5	2.2	2.2	2.0	1.8	1.8	3.2

Notes:
1. All statistics are weighted by establishment. See text for details.

Table 7A

Decomposition of Unconditional Vacancy Rate Variances by Sub-categories

Sub-category:	Panel A: All Vacancies					
All Establishments:	total	%	within	%	between	%
by region[1]	0.01814	100.0	0.01802	99.3	0.00012	0.7
by industry type[2]	0.01814	100.0	0.01804	99.4	0.00010	0.6
by sector[3]	0.01814	100.0	0.01811	99.8	0.00003	0.2
by establishment size[4]	0.01814	100.0	0.01807	99.6	0.00007	0.4
by LLSC area[5]	0.01814	100.0	0.01747	96.3	0.00067	3.7

Sub-category:	Panel B: Hard-to-fill Vacancies					
All Establishments:	total	%	within	%	between	%
by region	0.00929	100.0	0.00925	99.6	0.00003	0.3
by industry type	0.00929	100.0	0.00925	99.6	0.00003	0.3
by sector	0.00929	100.0	0.00927	99.8	0.00001	0.1
by establishment size	0.00929	100.0	0.00927	99.8	0.00002	0.1
by LLSC area	0.00929	100.0	0.00905	97.4	0.00023	2.5

Sub-category:	Panel C: Non-hard-to-fill Vacancies					
All Establishments:	total	%	within	%	between	%
by region	0.00866	100.0	0.00861	99.4	0.00005	0.6
by industry type	0.00866	100.0	0.00862	99.5	0.00004	0.4
by sector	0.00866	100.0	0.00863	99.7	0.00002	0.2
by establishment size	0.00866	100.0	0.00864	99.8	0.00001	0.2
by LLSC area	0.00866	100.0	0.00834	96.3	0.00032	3.7

Sub-category:	Panel D: Skill-Shortage Vacancies					
All Establishments:	total	%	within	%	between	%
by region	0.00443	100.0	0.00442	99.8	0.00001	0.2
by industry type	0.00443	100.0	0.00441	99.5	0.00002	0.4
by sector	0.00443	100.0	0.00442	99.8	0.00001	0.2
by establishment size	0.00443	100.0	0.00442	99.8	0.00001	0.2
by LLSC area	0.00443	100.0	0.00430	97.1	0.00013	2.9

Sub-category:	Panel E: Non-Skill-Shortage Vacancies					
All Establishments:	total	%	within	%	between	%
by region	0.01271	100.0	0.01262	99.3	0.00009	0.7
by industry type	0.01271	100.0	0.01265	99.5	0.00006	0.5
by sector	0.01271	100.0	0.01270	99.9	0.00001	0.1
by establishment size	0.01271	100.0	0.01268	99.8	0.00003	0.2
by LLSC area	0.01271	100.0	0.01226	96.4	0.00045	3.5

Notes:
1. Region: 9 categories: Eastern; East Midlands; London; North-East; North-West; South-East; South-West; West Midlands; and Yorkshire and Humberside
2. Industry type: 14 categories: agriculture; mining & quarrying; manufacturing; electricity and water supply; construction; wholesale and retail; hotels and restaurants; transport and communication; finance; business services; public administration; education; health and social work; and other community.
3. Sector: 3 categories: private sector; public sector; and voluntary sector.
4. Establishment size: 8 categories: 1-4; 5-9; 10-24; 25-49; 50-99; 100-199, 200-499; and 500 or more workers.
5. LLSC area: 47 categories: 47 local Learning and Skills Council areas.

Table 7B

Decomposition of Conditional Vacancy Rate Variances by Sub-categories

Sub-category:	**Panel A: All Vacancies**					
Establishments with v > 0:	total	%	within	%	between	%
by region[1]	0.05235	100.0	0.05062	96.7	0.00173	3.3
by industry type[2]	0.05235	100.0	0.04590	87.7	0.00645	12.3
by sector[3]	0.05235	100.0	0.05014	95.8	0.00221	4.2
by establishment size[4]	0.05235	100.0	0.01517	29.0	0.03718	71.0
by LLSC area[5]	0.05235	100.0	0.04459	85.2	0.00775	14.8

Sub-category:	**Panel B: Hard-to-fill Vacancies**					
Establishments with v > 0:	total	%	within	%	between	%
by region	0.05026	100.0	0.04892	97.3	0.00133	2.7
by industry type	0.05026	100.0	0.04329	86.1	0.00696	13.8
by sector	0.05026	100.0	0.04748	94.5	0.00277	5.5
by establishment size	0.05026	100.0	0.01757	35.0	0.03268	65.0
by LLSC area	0.05026	100.0	0.03801	75.6	0.01223	24.3

Sub-category:	**Panel C: Non-hard-to-fill Vacancies**					
Establishments with v > 0:	total	%	within	%	between	%
by region	0.04479	100.0	0.04299	96.0	0.00179	4.0
by industry type	0.04479	100.0	0.03953	88.3	0.00525	11.7
by sector	0.04479	100.0	0.04358	97.3	0.00120	2.7
by establishment size	0.04479	100.0	0.01174	26.2	0.03304	73.8
by LLSC area	0.04479	100.0	0.03326	74.3	0.01152	25.7

Sub-category:	**Panel D: Skill-Shortage Vacancies**					
Establishments with v > 0:	total	%	within	%	between	%
by region	0.04286	100.0	0.03955	92.3	0.00329	7.7
by industry type	0.04286	100.0	0.03770	88.0	0.00514	12.0
by sector	0.04286	100.0	0.04139	96.6	0.00145	3.4
by establishment size	0.04286	100.0	0.01524	35.6	0.02760	64.4
by LLSC area	0.04286	100.0	0.02677	62.4	0.01607	37.5

Sub-category	**Panel E: Non-Skill-Shortage Vacancies**					
Establishments with v > 0:	total	%	within	%	between	%
by region	0.04374	100.0	0.04213	96.3	0.00161	3.7
by industry type	0.04374	100.0	0.03853	88.0	0.00521	11.9
by sector	0.04374	100.0	0.04231	96.7	0.00142	3.2
by establishment size	0.04374	100.0	0.01186	27.1	0.03187	72.9
by LLSC area	0.04374	100.0	0.03597	82.2	0.00776	17.7

Notes:
1. Region: 9 categories: Eastern; East Midlands; London; North-East; North-West; South-East; South-West; West Midlands; and Yorkshire and Humberside
2. Industry type: 14 categories: agriculture; mining & quarrying; manufacturing; electricity and water supply; construction; wholesale and retail; hotels and restaurants; transport and communication; finance; business services; public administration; education; health and social work; and other community.
3. Sector: 3 categories: private sector; public sector; and voluntary sector.
4. Establishment size: 8 categories: 1-4; 5-9; 10-24; 25-49; 50-99; 100-199, 200-499; and 500 or more workers.
5. LLSC area: 47 categories: 47 local Learning and Skills Council areas.

Table 8

Determinants of Vacancy Incidence and Rate: All Vacancies

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
est. size 5-9$	0.058***	0.062***	0.062***	-0.216***	-0.208***	-0.207***	-0.0096	-0.0072	-0.0071
	(0.008)	(0.008)	(0.008)	(0.004)	(0.004)	(0.004)			
est. size 10-24$	0.151***	0.159***	0.159***	-0.291***	-0.280***	-0.275***	0.0047	0.0083	0.0091
	(0.010)	(0.010)	(0.010)	(0.004)	(0.004)	(0.004)			
est. size 25-49$	0.248***	0.257***	0.258***	-0.377***	-0.364***	-0.355***	0.0189	0.0229	0.0243
	(0.017)	(0.017)	(0.018)	(0.006)	(0.006)	(0.006)			
est. size 50-99$	0.370***	0.377***	0.381***	-0.435***	-0.422***	-0.412***	0.0417	0.0458	0.0480
	(0.024)	(0.024)	(0.025)	(0.009)	(0.009)	(0.008)			
est. size 10-199$	0.443***	0.448***	0.455***	-0.498***	-0.485***	-0.474***	0.0525	0.0562	0.0592
	(0.038)	(0.038)	(0.039)	(0.016)	(0.015)	(0.015)			
est. size 200-499$	0.533***	0.538***	0.554***	-0.591***	-0.576***	-0.565***	0.0639	0.0681	0.0733
	(0.044)	(0.044)	(0.044)	(0.023)	(0.022)	(0.021)			
est. size 500+$	0.621***	0.620***	0.628***	-0.614***	-0.600***	-0.587***	0.0826	0.0852	0.0887
	(0.078)	(0.079)	(0.079)	(0.043)	(0.042)	(0.041)			
private sector$	0.013**	0.013**	0.021***	-0.028***	-0.023***	-0.033***	0.0001	0.0006	0.0016
	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.004)			
foreign owned$	-0.024**	-0.029***	-0.028***	0.019***	0.014**	0.013**	-0.0037	-0.0056	-0.0053
	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.006)			
single$	-0.034***	-0.037***	-0.032***	0.026***	0.025***	0.023***	-0.0055	-0.0063	-0.0053
	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)			
increase in sales$	0.088***	0.081***	0.080***	0.041***	0.042***	0.042***	0.0255	0.0240	0.0237
	(0.008)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)			
decrease in sales$	-0.047***	-0.046***	-0.045***	0.006	0.014**	0.015**	-0.0107	-0.0096	-0.0091
	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)			
hire rate	0.043***	0.042***	0.043***	0.009***	0.010***	0.012***	0.0112	0.0113	0.0116
	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)			
quit rate	0.022***	0.021***	0.022***	0.011***	0.009***	0.008***	0.0064	0.0061	0.0061
	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)			
training 1-20%$	0.039***	0.039***	0.039***	-0.032***	-0.038***	-0.035***	0.0058	0.0053	0.0056
	(0.008)	(0.008)	(0.008)	(0.004)	(0.004)	(0.004)			
training 20-80%$	0.063***	0.061***	0.060***	-0.037***	-0.039***	-0.035***	0.0111	0.0105	0.0108
	(0.008)	(0.008)	(0.008)	(0.004)	(0.003)	(0.003)			

	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
Specification:	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
training 80-100%$	0.064***	0.061***	0.058***	0.033***	0.029***	0.033***	0.0190	0.0177	0.0175
	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)			
head office$	-0.011	-0.017**	-0.014*	0.025***	0.026***	0.026***	0.0000	-0.0014	-0.0007
	(0.008)	(0.007)	(0.008)	(0.005)	(0.005)	(0.005)			
LLSC industry empl.		0.068**	0.036		0.026	0.029		0.0190	0.0117
		(0.029)	(0.053)		(0.017)	(0.030)			
LLSC low skills		0.516***	0.548***		0.178**	0.230***		0.1431	0.1561
		(0.121)	(0.121)		(0.074)	(0.073)			
LLSC high skills		0.081	0.095		-0.167***	-0.110**		0.0016	0.0112
		(0.090)	(0.089)		(0.053)	(0.053)			
LLSC empl. growth		0.084	0.100*		0.154***	0.131***		0.0366	0.0380
		(0.057)	(0.056)		(0.033)	(0.032)			
LLSC relative wage		0.104***	0.097***		0.035**	0.029*		0.0286	0.0264
		(0.026)	(0.026)		(0.016)	(0.015)			
ND_participation		0.650***	0.636***		0.299***	0.283***		0.1880	0.1829
		(0.092)	(0.092)		(0.057)	(0.056)			
ND_efficacy		0.032	0.050		-0.186***	-0.222***		-0.0122	-0.0115
		(0.118)	(0.118)		(0.066)	(0.065)			
LLSC log(ilo_urate)		-0.106***	-0.106***		-0.041***	-0.045***		-0.0299	-0.0303
		(0.012)	(0.012)		(0.007)	(0.007)			
Constant				0.365***	0.332***	0.347***			
				(0.004)	(0.046)	(0.047)			
industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	25795	25795	25795	8878	8878	8878			

Notes:

1. $ denotes dummy variable.
2.   * denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9A

Determinants of Vacancy Incidence and Rate: Hard-to-Fill Vacancies

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
est. size 5-9$	0.043***	0.045***	0.045***	-0.185***	-0.184***	-0.183***	0.0008	0.0013	0.0015
	(0.006)	(0.006)	(0.007)	(0.006)	(0.005)	(0.005)			
est. size 10-24$	0.103***	0.107***	0.106***	-0.266***	-0.262***	-0.259***	0.0108	0.0118	0.0118
	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.006)			
est. size 25-49$	0.153***	0.157***	0.155***	-0.363***	-0.358***	-0.349***	0.0175	0.0188	0.0187
	(0.015)	(0.015)	(0.016)	(0.011)	(0.010)	(0.010)			
est. size 50-99$	0.235***	0.239***	0.240***	-0.415***	-0.409***	-0.394***	0.0339	0.0353	0.0361
	(0.023)	(0.023)	(0.023)	(0.014)	(0.013)	(0.013)			
est. size 10-199$	0.250***	0.252***	0.255***	-0.536***	-0.523***	-0.500***	0.0315	0.0326	0.0344
	(0.037)	(0.037)	(0.038)	(0.030)	(0.029)	(0.027)			
est. size 200-499$	0.281***	0.284***	0.299***	-0.700***	-0.679***	-0.652***	0.0308	0.0324	0.0372
	(0.046)	(0.046)	(0.047)	(0.051)	(0.047)	(0.045)			
est. size 500+$	0.385***	0.383***	0.394***	-0.766***	-0.740***	-0.712***	0.0515	0.0525	0.0563
	(0.091)	(0.091)	(0.092)	(0.098)	(0.092)	(0.088)			
private sector$	0.009**	0.009**	0.015***	0.058***	0.047***	0.040***	0.0048	0.0044	0.0053
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.007)			
foreign owned$	0.000	-0.003	-0.001	0.024**	0.027***	0.029***	0.0013	0.0007	0.0012
	(0.008)	(0.007)	(0.007)	(0.010)	(0.010)	(0.010)			
single$	0.020***	0.017***	0.018***	0.012**	0.013**	0.018***	0.0051	0.0047	0.0049
	(0.004)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)			
increase in sales$	0.058***	0.053***	0.053***	0.077***	0.064***	0.068***	0.0173	0.0154	0.0156
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)			
decrease in sales$	-0.017***	-0.017***	-0.017***	0.036***	0.032***	0.035***	-0.0021	-0.0024	-0.0021
	(0.006)	(0.006)	(0.006)	(0.012)	(0.011)	(0.011)			
hire rate	0.027***	0.026***	0.026***	-0.012***	-0.010***	-0.009***	0.0056	0.0055	0.0056
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)			
quit rate	0.005**	0.006**	0.005**	0.023***	0.019***	0.017***	0.0024	0.0022	0.0020
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)			
training 1-20%$	0.008	0.008	0.008	-0.033***	-0.034***	-0.033***	0.0001	0.0002	0.0002
	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)			
training 20-80%$	0.027***	0.026***	0.025***	-0.062***	-0.052***	-0.053***	0.0031	0.0035	0.0031
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)			

	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
Specification:	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
training 80-100%$	0.046***	0.044***	0.040***	0.010**	0.011**	0.008*	0.0112	0.0106	0.0097
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)			
head office$	0.013*	0.010	0.010	0.012	0.017**	0.013	0.0035	0.0031	0.0030
	(0.007)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)			
LLSC industry empl.		0.013	0.090**		-0.037	0.206***		0.0011	0.0308
		(0.020)	(0.037)		(0.025)	(0.048)			
LLSC low skills		0.087	0.114		0.204*	0.073		0.0302	0.0299
		(0.084)	(0.083)		(0.109)	(0.108)			
LLSC high skills		-0.026	-0.028		0.588***	0.464***		0.0228	0.0163
		(0.061)	(0.061)		(0.079)	(0.079)			
LLSC empl. growth		-0.046	-0.033		-0.402***	-0.391***		-0.0304	-0.0267
		(0.039)	(0.039)		(0.051)	(0.050)			
LLSC relative wage		0.094***	0.088***		0.006	0.025		0.0220	0.0215
		(0.018)	(0.018)		(0.025)	(0.025)			
ND_participation		0.277***	0.271***		-0.006	-0.109		0.0637	0.0574
		(0.064)	(0.064)		(0.087)	(0.086)			
ND_efficacy		0.063	0.066		0.096	-0.003		0.0192	0.0150
		(0.082)	(0.081)		(0.097)	(0.095)			
LLSC log(ilo_urate)		-0.044***	-0.045***		0.010	0.008		-0.0098	-0.0101
		(0.008)	(0.008)		(0.010)	(0.010)			
Constant				0.273***	0.080	0.246***			
				(0.008)	(0.069)	(0.070)			
industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	25795	25795	25795	4382	4382	4382			

Notes:
1. $ denotes dummy variable.
2. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9B

Determinants of Vacancy Incidence and Rate: Non-Hard-to-Fill Vacancies

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
est. size 5-9$	0.019***	0.023***	0.023***	-0.215***	-0.215***	-0.209***	-0.0079	-0.0068	-0.0064
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)			
est. size 10-24$	0.063***	0.069***	0.071***	-0.293***	-0.289***	-0.279***	-0.0029	-0.0009	0.0000
	(0.007)	(0.007)	(0.008)	(0.005)	(0.005)	(0.004)			
est. size 25-49$	0.133***	0.140***	0.143***	-0.385***	-0.379***	-0.363***	0.0071	0.0095	0.0110
	(0.014)	(0.014)	(0.015)	(0.008)	(0.007)	(0.007)			
est. size 50-99$	0.205***	0.210***	0.213***	-0.466***	-0.456***	-0.440***	0.0181	0.0204	0.0219
	(0.021)	(0.021)	(0.021)	(0.011)	(0.011)	(0.010)			
est. size 10-199$	0.297***	0.300***	0.303***	-0.513***	-0.499***	-0.480***	0.0352	0.0372	0.0389
	(0.036)	(0.037)	(0.037)	(0.018)	(0.017)	(0.016)			
est. size 200-499$	0.413***	0.415***	0.422***	-0.618***	-0.597***	-0.573***	0.0542	0.0567	0.0595
	(0.047)	(0.047)	(0.047)	(0.026)	(0.024)	(0.022)			
est. size 500+$	0.498***	0.493***	0.493***	-0.662***	-0.642***	-0.612***	0.0699	0.0710	0.0726
	(0.090)	(0.090)	(0.091)	(0.050)	(0.046)	(0.043)			
private sector$	-0.010**	-0.010**	-0.009*	-0.023***	-0.015***	-0.028***	-0.0034	-0.0031	-0.0034
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)			
foreign owned$	-0.017***	-0.021***	-0.021***	0.002	0.002	0.002	-0.0035	-0.0044	-0.0044
	(0.006)	(0.006)	(0.005)	(0.008)	(0.008)	(0.007)			
single$	-0.043***	-0.044***	-0.041***	0.002	0.001	0.006*	-0.0092	-0.0094	-0.0084
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)			
increase in sales$	0.029***	0.026***	0.024***	-0.008**	-0.010***	-0.002	0.0058	0.0051	0.0050
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)			
decrease in sales$	-0.028***	-0.026***	-0.025***	-0.036***	-0.015*	-0.009	-0.0081	-0.0064	-0.0059
	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.009)			
hire rate	0.022***	0.022***	0.022***	-0.011***	-0.011***	-0.009***	0.0041	0.0041	0.0042
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)			
quit rate	0.008***	0.006**	0.007***	0.026***	0.022***	0.019***	0.0031	0.0025	0.0025
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)			
training 1-20%$	0.032***	0.031***	0.030***	-0.033***	-0.030***	-0.026***	0.0051	0.0049	0.0050
	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)			
training 20-80%$	0.046***	0.043***	0.042***	-0.037***	-0.038***	-0.031***	0.0078	0.0072	0.0074
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)			

	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
Specification:	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
training 80-100%$	0.029***	0.026***	0.025***	0.030***	0.032***	0.040***	0.0080	0.0074	0.0075
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)			
head office$	-0.012**	-0.015***	-0.014***	0.021***	0.028***	0.029***	-0.0014	-0.0016	-0.0015
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)			
LLSC industry empl.		0.090***	-0.012		-0.204***	-0.241***		0.0083	-0.0157
		(0.022)	(0.038)		(0.021)	(0.036)			
LLSC low skills		0.391***	0.387***		0.609***	0.728***		0.1172	0.1228
		(0.089)	(0.088)		(0.091)	(0.089)			
LLSC high skills		-0.038	-0.029		0.147**	0.282***		-0.0001	0.0091
		(0.066)	(0.065)		(0.065)	(0.064)			
LLSC empl. growth		0.200***	0.201***		0.354***	0.287***		0.0622	0.0588
		(0.041)	(0.041)		(0.040)	(0.038)			
LLSC relative wage		0.039**	0.036*		-0.137***	-0.142***		0.0008	0.0001
		(0.019)	(0.019)		(0.018)	(0.018)			
ND_participation		0.344***	0.332***		0.614***	0.613***		0.1073	0.1047
		(0.067)	(0.066)		(0.067)	(0.064)			
ND_efficacy		-0.144*	-0.122		0.088	0.148*		-0.0261	-0.0182
		(0.085)	(0.084)		(0.078)	(0.075)			
LLSC log(ilo_urate)		-0.069***	-0.067***		-0.056***	-0.054***		-0.0179	-0.0173
		(0.009)	(0.009)		(0.009)	(0.009)			
Constant				0.376***	0.217***	0.069			
				(0.005)	(0.054)	(0.056)			
industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	25795	25795	25795	5864	5864	5864			

Notes:
1. $ denotes dummy variable.
2. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10A

Determinants of Vacancy Incidence and Rate: Skill-Shortage Vacancies

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
est. size 5-9$	0.013***	0.014***	0.016***	-0.183***	-0.177***	-0.168***	-0.0015	-0.0009	-0.0001
	(0.004)	(0.004)	(0.004)	(0.008)	(0.007)	(0.007)			
est. size 10-24$	0.040***	0.043***	0.046***	-0.251***	-0.238***	-0.232***	0.0032	0.0044	0.0053
	(0.006)	(0.006)	(0.006)	(0.008)	(0.007)	(0.007)			
est. size 25-49$	0.061***	0.066***	0.069***	-0.344***	-0.325***	-0.314***	0.0059	0.0076	0.0088
	(0.011)	(0.011)	(0.012)	(0.015)	(0.013)	(0.012)			
est. size 50-99$	0.105***	0.111***	0.115***	-0.390***	-0.364***	-0.346***	0.0150	0.0171	0.0186
	(0.017)	(0.018)	(0.018)	(0.019)	(0.017)	(0.015)			
est. size 10-199$	0.115***	0.119***	0.120***	-0.455***	-0.423***	-0.401***	0.0156	0.0176	0.0186
	(0.028)	(0.029)	(0.029)	(0.036)	(0.031)	(0.028)			
est. size 200-499$	0.147***	0.151***	0.152***	-0.668***	-0.602***	-0.563***	0.0180	0.0207	0.0223
	(0.038)	(0.038)	(0.038)	(0.071)	(0.060)	(0.054)			
est. size 500+$	0.198**	0.201**	0.203**	-0.689***	-0.627***	-0.590***	0.0294	0.0318	0.0334
	(0.079)	(0.079)	(0.080)	(0.128)	(0.109)	(0.098)			
private sector$	0.003	0.003	0.002	0.084***	0.049***	0.040***	0.0027	0.0019	0.0014
	(0.003)	(0.003)	(0.003)	(0.008)	(0.009)	(0.009)			
foreign owned$	0.001	-0.002	-0.002	0.004	0.008	0.015	0.0004	-0.0003	-0.0002
	(0.006)	(0.005)	(0.005)	(0.017)	(0.015)	(0.014)			
single$	0.020***	0.018***	0.016***	0.015*	0.014*	0.012*	0.0050	0.0045	0.0039
	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)	(0.007)			
increase in sales$	0.040***	0.035***	0.033***	0.062***	0.061***	0.054***	0.0107	0.0096	0.0090
	(0.004)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)			
decrease in sales$	-0.012***	-0.012***	-0.012***	0.015	-0.003	-0.008	-0.0025	-0.0029	-0.0029
	(0.004)	(0.004)	(0.004)	(0.020)	(0.018)	(0.018)			
hire rate	0.016***	0.015***	0.014***	0.006**	0.003	0.013***	0.0038	0.0035	0.0036
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)			
quit rate	-0.003**	-0.003*	-0.003*	-0.017***	-0.005	-0.012***	-0.0012	-0.0008	-0.0009
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)			
training 1-20%$	0.008**	0.007*	0.007*	-0.024**	-0.023***	-0.024***	0.0013	0.0012	0.0011
	(0.004)	(0.004)	(0.004)	(0.009)	(0.009)	(0.008)			
training 20-80%$	0.012***	0.011***	0.010***	-0.047***	-0.037***	-0.040***	0.0017	0.0017	0.0014
	(0.004)	(0.004)	(0.004)	(0.008)	(0.007)	(0.007)			

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
training 80-100%$	0.039***	0.035***	0.032***	-0.012**	-0.002	-0.006	0.0088	0.0081	0.0072
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)			
head office$	0.023***	0.020***	0.017***	0.016	0.011	0.013	0.0058	0.0050	0.0043
	(0.006)	(0.006)	(0.006)	(0.011)	(0.011)	(0.010)			
LLSC industry empl.		0.063***	0.143***		-0.133***	0.382***		0.0115	0.0422
		(0.013)	(0.024)		(0.034)	(0.067)			
LLSC low skills		-0.039	-0.044		-0.184	-0.359***		-0.0134	-0.0187
		(0.054)	(0.054)		(0.135)	(0.133)			
LLSC high skills		-0.100**	-0.110***		-0.053	-0.178*		-0.0245	-0.0297
		(0.040)	(0.039)		(0.101)	(0.100)			
LLSC empl. growth		-0.082***	-0.075***		-0.746***	-0.670***		-0.0367	-0.0330
		(0.025)	(0.025)		(0.063)	(0.061)			
LLSC relative wage		0.078***	0.068***		0.108***	0.070**		0.0208	0.0174
		(0.012)	(0.012)		(0.033)	(0.034)			
ND_participation		0.150***	0.144***		0.240**	0.240**		0.0406	0.0392
		(0.042)	(0.042)		(0.117)	(0.113)			
ND_efficacy		0.101*	0.101*		0.258**	0.078		0.0297	0.0254
		(0.054)	(0.053)		(0.114)	(0.111)			
LLSC log(ilo_urate)		-0.015***	-0.014**		-0.021*	-0.037***		-0.0040	-0.0041
		(0.005)	(0.005)		(0.012)	(0.012)			
Constant				0.244***	0.099	0.216***			
				(0.011)	(0.080)	(0.082)			
industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	25795	25795	25795	1958	1958	1958			

Notes:

1. $ denotes dummy variable.
2. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10B

Determinants of Vacancy Incidence and Rate: Non-Skill-Shortage Vacancies

Specification:	Vacancy Incidence: Probit			Vacancy Intensity: Truncated			Marginal Effects		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
est. size 5-9$	0.043***	0.048***	0.048***	-0.206***	-0.201***	-0.200***	-0.0079	-0.0059	-0.0060
	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.003)			
est. size 10-24$	0.115***	0.122***	0.122***	-0.282***	-0.276***	-0.269***	0.0017	0.0045	0.0050
	(0.009)	(0.009)	(0.009)	(0.004)	(0.004)	(0.004)			
est. size 25-49$	0.206***	0.213***	0.213***	-0.367***	-0.359***	-0.348***	0.0148	0.0178	0.0188
	(0.016)	(0.016)	(0.017)	(0.007)	(0.006)	(0.006)			
est. size 50-99$	0.306***	0.311***	0.314***	-0.428***	-0.418***	-0.406***	0.0320	0.0349	0.0366
	(0.023)	(0.024)	(0.024)	(0.009)	(0.009)	(0.008)			
est. size 10-199$	0.387***	0.390***	0.397***	-0.494***	-0.481***	-0.465***	0.0446	0.0474	0.0503
	(0.038)	(0.039)	(0.039)	(0.016)	(0.015)	(0.014)			
est. size 200-499$	0.486***	0.489***	0.507***	-0.580***	-0.562***	-0.543***	0.0596	0.0629	0.0685
	(0.046)	(0.046)	(0.046)	(0.023)	(0.022)	(0.020)			
est. size 500+$	0.566***	0.562***	0.571***	-0.607***	-0.591***	-0.569***	0.0751	0.0769	0.0807
	(0.085)	(0.086)	(0.086)	(0.044)	(0.041)	(0.038)			
private sector$	-0.002	-0.003	0.005	-0.013***	-0.008**	-0.019***	-0.0016	-0.0013	-0.0004
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)			
foreign owned$	-0.017**	-0.024***	-0.022***	0.012*	0.011*	0.013**	-0.0029	-0.0043	-0.0038
	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)			
single$	-0.045***	-0.047***	-0.041***	0.004	0.003	0.012***	-0.0097	-0.0103	-0.0082
	(0.006)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)			
increase in sales$	0.060***	0.053***	0.052***	0.000	0.002	0.009***	0.0134	0.0121	0.0123
	(0.007)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)			
decrease in sales$	-0.036***	-0.035***	-0.034***	0.009	0.014**	0.023***	-0.0074	-0.0067	-0.0057
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)			
hire rate	0.027***	0.028***	0.028***	-0.003	-0.006***	-0.005***	0.0059	0.0059	0.0059
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)			
quit rate	0.025***	0.023***	0.024***	0.013***	0.014***	0.012***	0.0068	0.0064	0.0063
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)			
training 1-20%$	0.032***	0.031***	0.031***	-0.030***	-0.031***	-0.026***	0.0046	0.0044	0.0047
	(0.008)	(0.008)	(0.007)	(0.004)	(0.004)	(0.004)			
training 20-80%$	0.055***	0.053***	0.051***	-0.037***	-0.039***	-0.028***	0.0092	0.0085	0.0091
	(0.007)	(0.007)	(0.007)	(0.004)	(0.003)	(0.003)			

| | Vacancy Incidence: Probit | | | Vacancy Intensity: Truncated | | | Marginal Effects | | |
Specification:	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
training 80-100%$	0.045***	0.041***	0.038***	0.007**	0.011***	0.026***	0.0108	0.0101	0.0107
	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)			
head office$	-0.018***	-0.023***	-0.021***	0.016***	0.015***	0.023***	-0.0028	-0.0039	-0.0029
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)			
LLSC industry empl.		0.075***	-0.016		-0.203***	-0.389***		-0.0000	-0.0361
		(0.026)	(0.047)		(0.018)	(0.030)			
LLSC low skills		0.566***	0.592***		0.476***	0.555***		0.1666	0.1790
		(0.109)	(0.108)		(0.077)	(0.074)			
LLSC high skills		0.154*	0.167**		0.087	0.190***		0.0417	0.0532
		(0.080)	(0.079)		(0.054)	(0.052)			
LLSC empl. growth		0.256***	0.268***		0.267***	0.212***		0.0797	0.0778
		(0.051)	(0.050)		(0.035)	(0.033)			
LLSC relative wage		0.042*	0.040*		-0.051***	-0.037**		0.0052	0.0058
		(0.023)	(0.023)		(0.016)	(0.015)			
ND_participation		0.429***	0.413***		0.494***	0.472***		0.1373	0.1321
		(0.082)	(0.081)		(0.058)	(0.056)			
ND_efficacy		-0.131	-0.116		-0.038	0.040		-0.0325	-0.0226
		(0.104)	(0.104)		(0.069)	(0.067)			
LLSC log(ilo_urate)		-0.084***	-0.084***		-0.054***	-0.049***		-0.0233	-0.0229
		(0.011)	(0.011)		(0.008)	(0.007)			
Constant				0.373***	0.244***	0.168***			
				(0.004)	(0.048)	(0.048)			
industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	25795	25795	25795	7673	7673	7673			

Notes:
1. $ denotes dummy variable.
2. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 11

**Vacancies and Alternative Measures of the Unemployment Rate
(using Specification C)**

unemployment measure:	total vacancies		hard-to-fill vacancies		non-hard-to-fill vacancies		skill-shortage vacancies		non- skill-shortage vacancies	
	incidence	rate	incidence	rate	incidence	rate	incidence	rate	incidence	rate
log(ilo_urate)	-0.106***	-0.045***	-0.045***	0.008	-0.067***	-0.054***	-0.014**	-0.037***	-0.084***	-0.049***
	(0.012)	(0.007)	(0.008)	(0.010)	(0.009)	(0.009)	(0.005)	(0.012)	(0.011)	(0.007)
log(urate)	-0.098***	-0.021***	-0.063***	-0.021**	-0.035***	0.002	-0.013**	-0.045***	-0.077***	-0.017**
	(0.013)	(0.007)	(0.009)	(0.009)	(0.009)	(0.008)	(0.006)	(0.013)	(0.011)	(0.007)
log(lturate)	-0.075***	-0.011**	-0.049***	-0.010	-0.027***	0.004	-0.009*	-0.035***	-0.057***	-0.010*
	(0.011)	(0.006)	(0.017)	(0.008)	(0.008)	(0.007)	(0.005)	(0.011)	(0.010)	(0.006)
log(nonempr)	-0.145***	-0.040***	-0.051***	0.005	-0.100***	-0.057***	0.003	0.028	-0.143***	-0.072***
	(0.025)	(0.013)	(0.017)	(0.018)	(0.018)	(0.016)	(0.011)	(0.025)	(0.022)	(0.014)

Notes:
1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.
2. ilo_urate is the unemployment rate calculated using the ILO definition as used in Table 8, 9A, 9B, 10A and 10B; urate is the claimant count rate; lturate is long-term unemployment rate (claimants who have been unemployed in excess of 6 months); nonempr is the non-employment rate.

Table 12

Vacancies and Local Unemployment by Green and Owen (2002) Classification of LLSCs
(using Specification C)

unemployment measure: log(ilo_urate)	total vacancies		hard-to-fill vacancies		non-hard-to-fill vacancies		skill-shortage vacancies		non- skill-shortage vacancies	
	incidence	rate	incidence	rate	incidence	rate	incidence	rate	incidence	rate
Group A LLSCs	-0.088***	-0.041***	-0.037***	0.007	-0.057***	-0.036***	-0.009*	-0.026**	-0.072***	-0.038***
	(0.014)	(0.007)	(0.009)	(0.010)	(0.010)	(0.009)	(0.005)	(0.013)	(0.012)	(0.007)
Group B LLSCs	-0.100***	-0.049***	-0.047***	-0.010	-0.057***	-0.034***	-0.017**	-0.043***	-0.073***	-0.037***
	(0.018)	(0.009)	(0.012)	(0.012)	(0.013)	(0.011)	(0.007)	(0.016)	(0.016)	(0.010)
Group C LLSCs	-0.138***	-0.059**	-0.069***	-0.031***	-0.071***	-0.052***	-0.034***	-0.080***	-0.090***	-0.047***
	(0.016)	(0.008)	(0.010)	(0.011)	(0.012)	(0.001)	(0.0056	(0.015)	(0.014)	(0.008)
Group D LLSCs	-0.115***	-0.047***	-0.060***	-0.010	-0.062***	-0.032***	-0.023***	-0.030**	-0.085***	-0.034***
	(0.015)	(0.008)	(0.010)	(0.011)	(0.011)	(0.009)	(0.006)	(0.014)	(0.013)	(0.008)

Notes:
1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.
2. The Green and Owen (2002) classification of LLSCs to Groups A-D is reported in Annex C.

Figure 1A

Vacancy Incidence by Establishment: Proportion Reporting Vacancies by Region
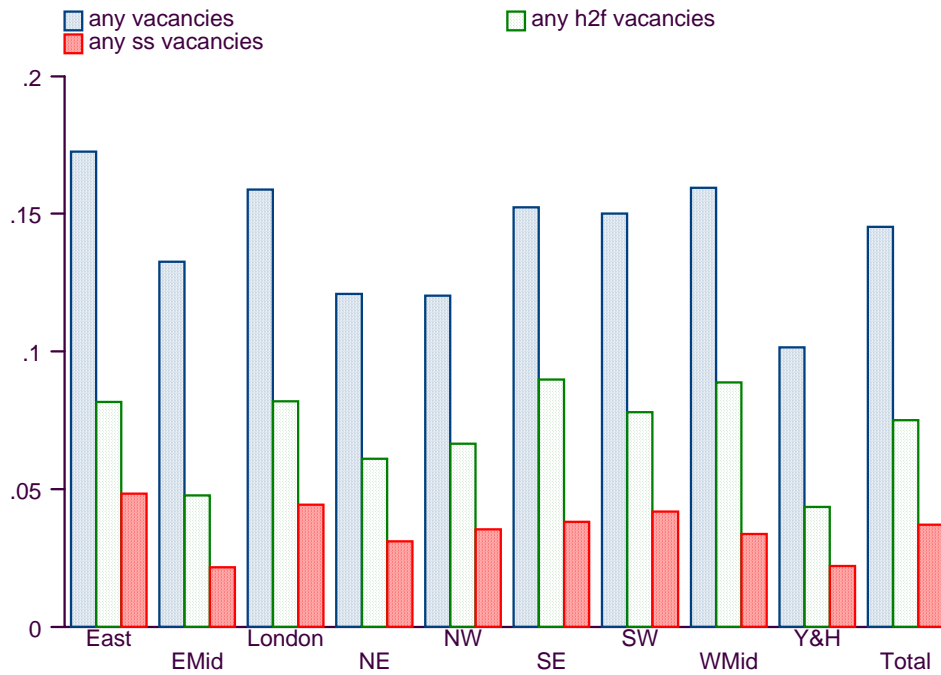
Figure 1B

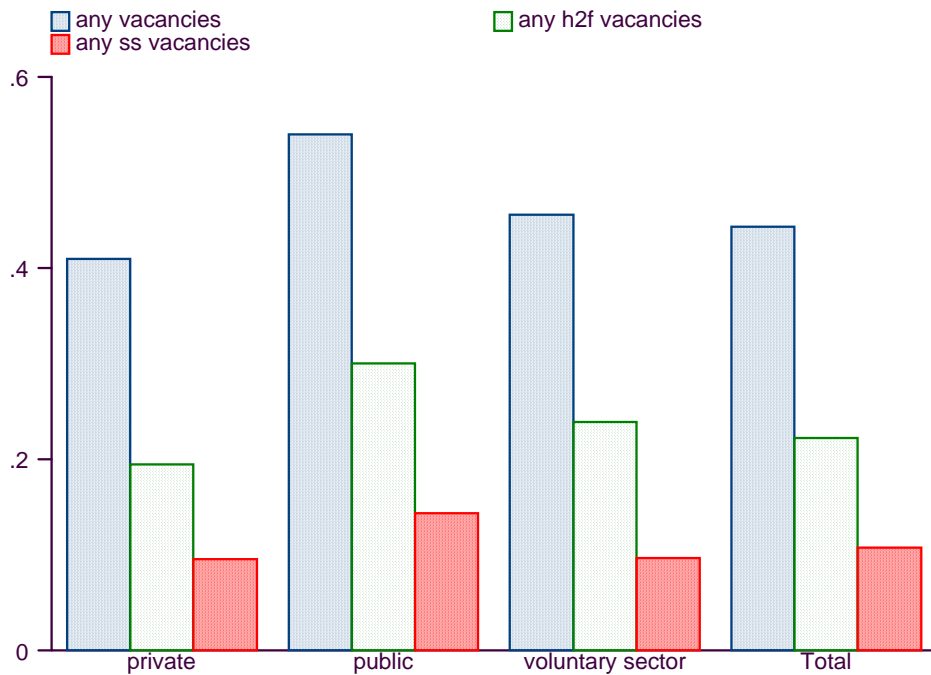**Vacancy Incidence by Employment: Proportion Reporting Vacancies by Region**
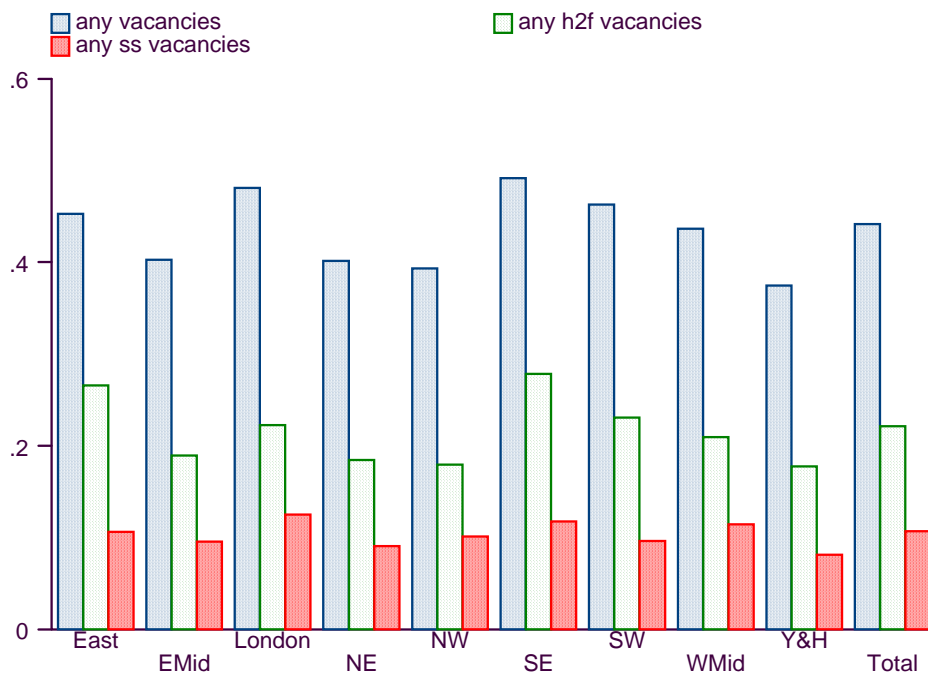
Figure 2A

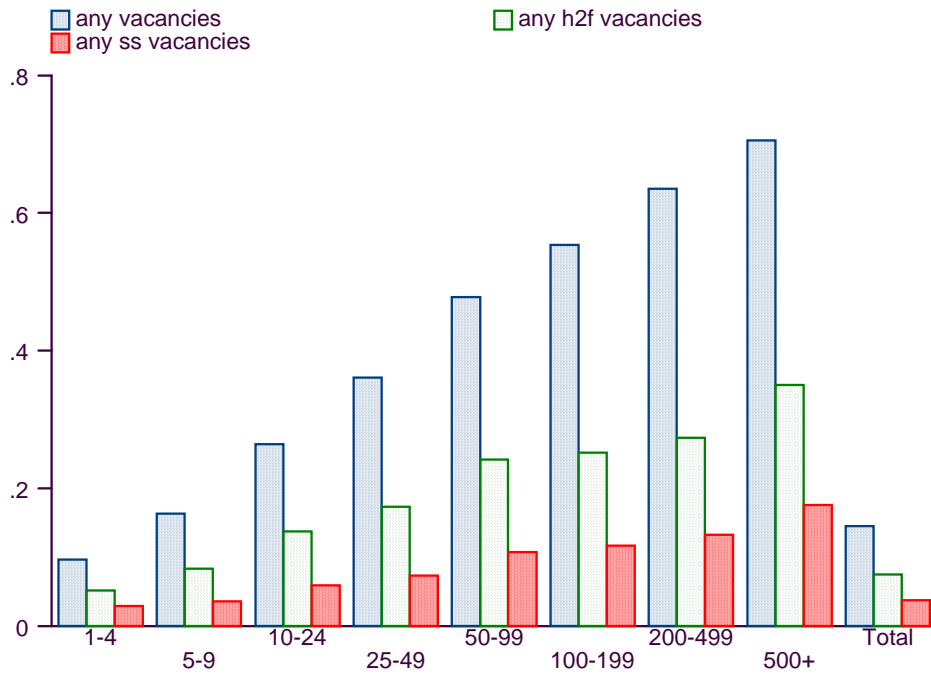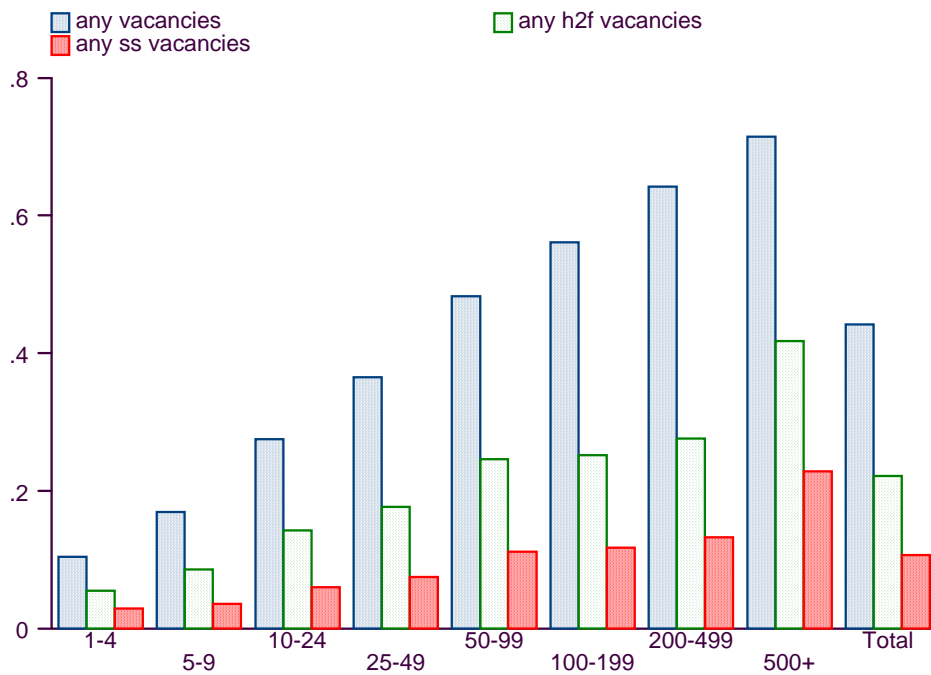**Vacancy Incidence by Establishment: Proportion Reporting Vacancies by Industry**
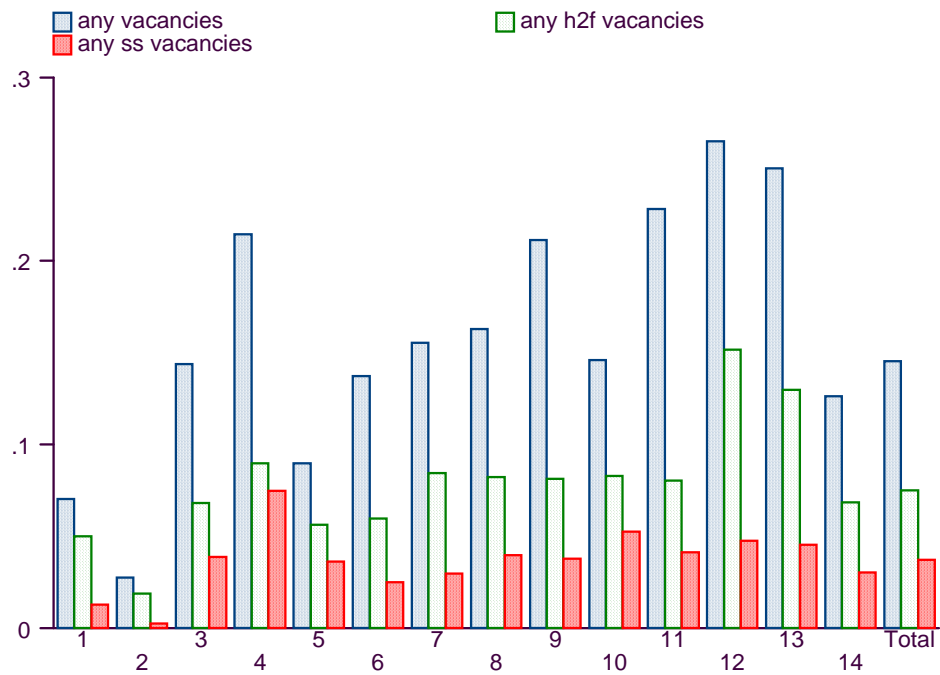
Figure 2B

Vacancy Incidence by Employment: Proportion Reporting Vacancies by Industry
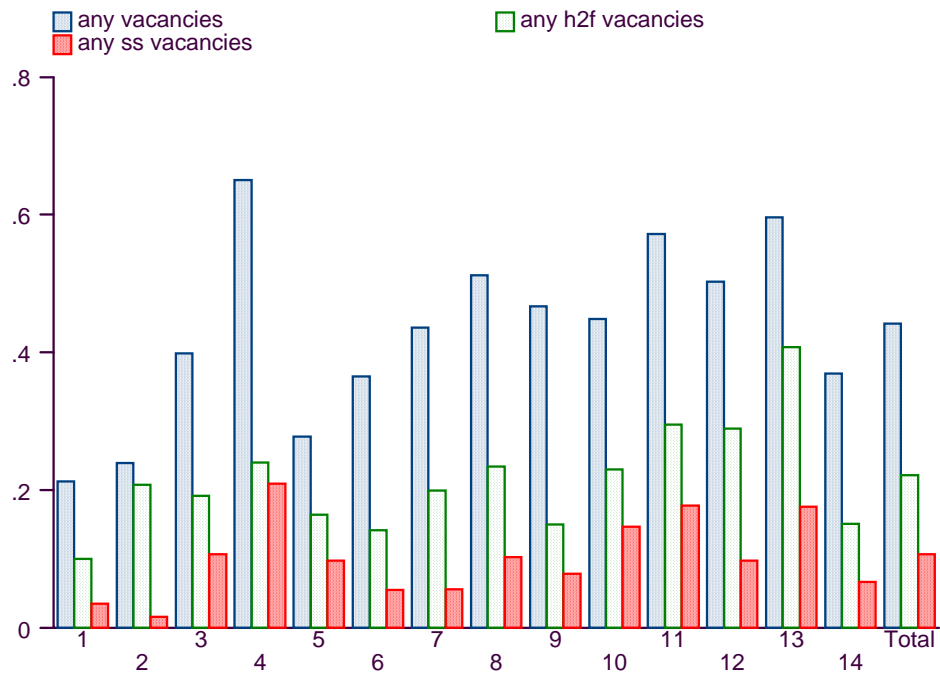
Key:

1	agriculture	5	construction	9	finance	13 health & social work
2	mining & quarrying	6	wholesale, retail	10 business services		14 other community
3	manufacturing	7	hotels and restaurants	11 public administration		
4	elect'y & water supply	8	transport & comm.	12 education		

54

Figure 3A

Vacancy Incidence by Establishment: Proportion Reporting Vacancies by Sector
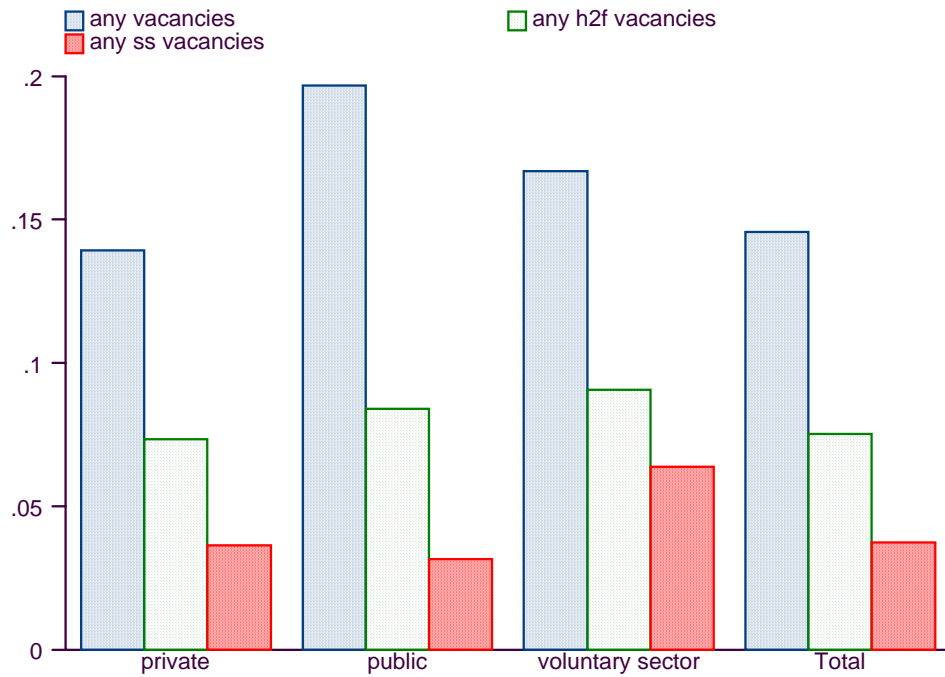
Figure 3B

Vacancy Incidence by Employment: Proportion Reporting Vacancies by Sector

Figure 4A

Vacancy Incidence by Establishment: Proportion Reporting Vacancies by Size

Figure 4B

Vacancy Incidence by Employment: Proportion Reporting Vacancies by Size

Figure 5A

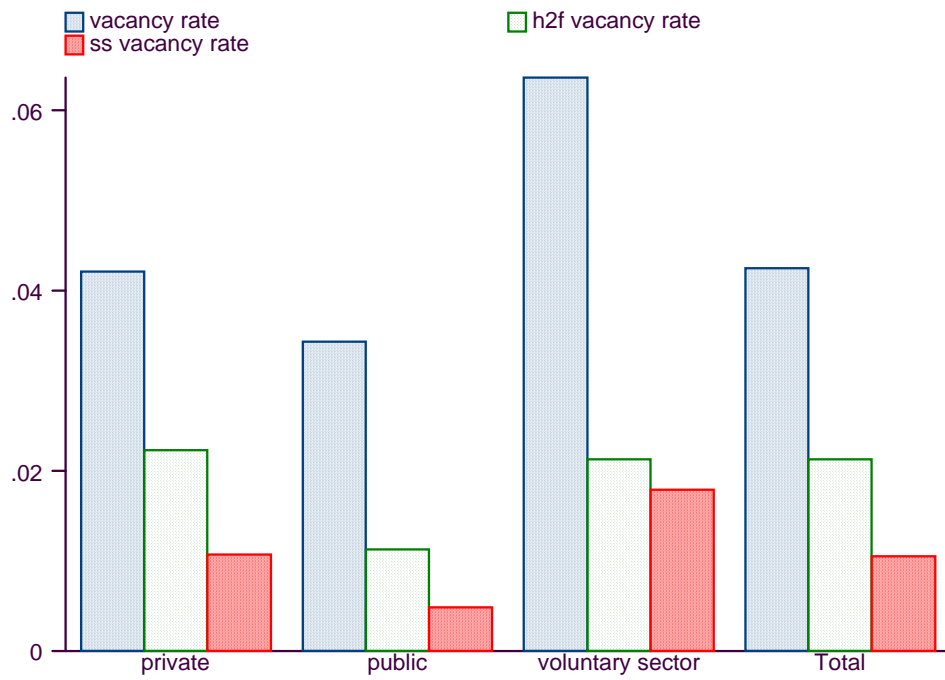**Vacancy Rate by Establishment: Proportion of Unfilled Jobs by Region**
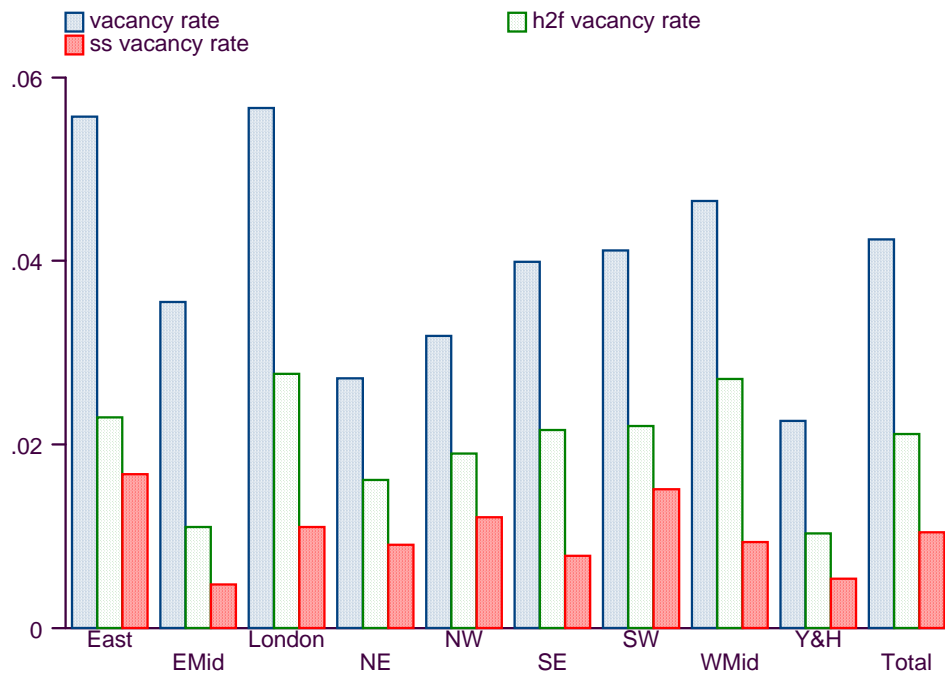
Figure 5B

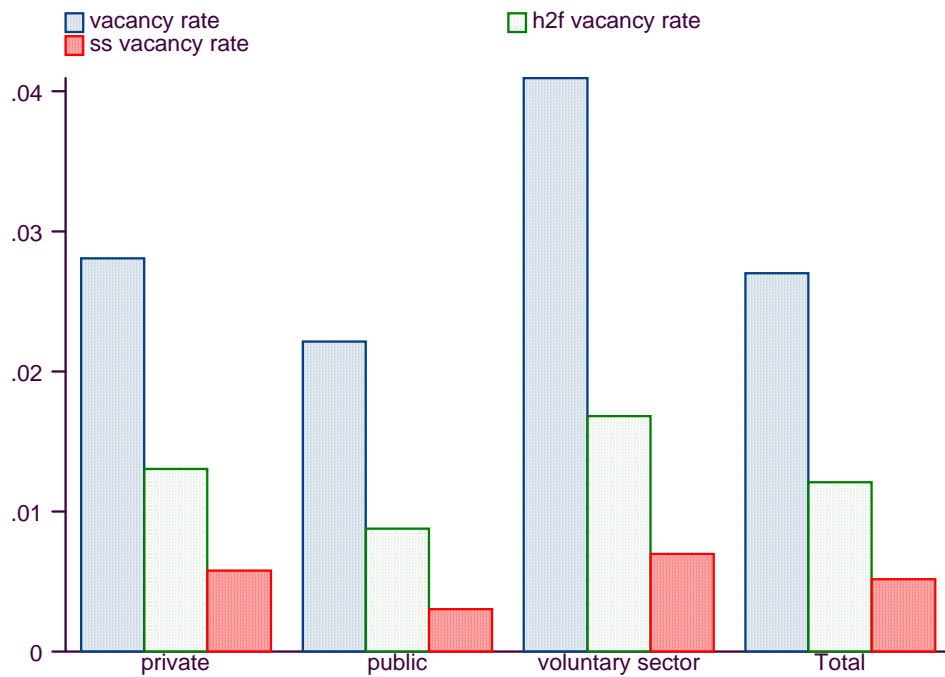**Vacancy Rate by Employment: Proportion of Unfilled Jobs by Region**
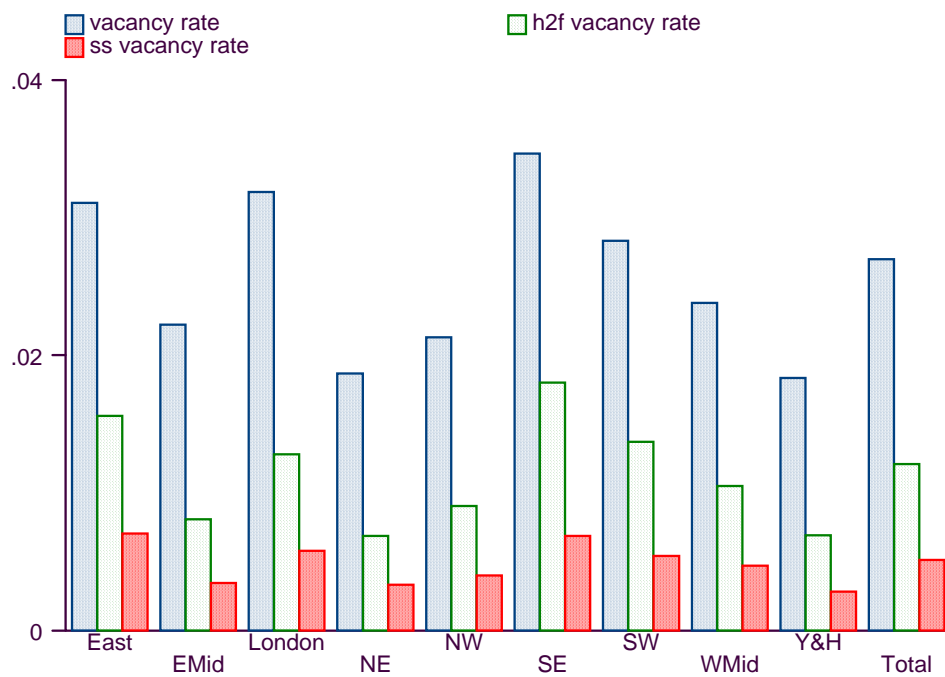
Figure 6A

Vacancy Rate by Establishment: Proportion of Unfilled Jobs by Industry
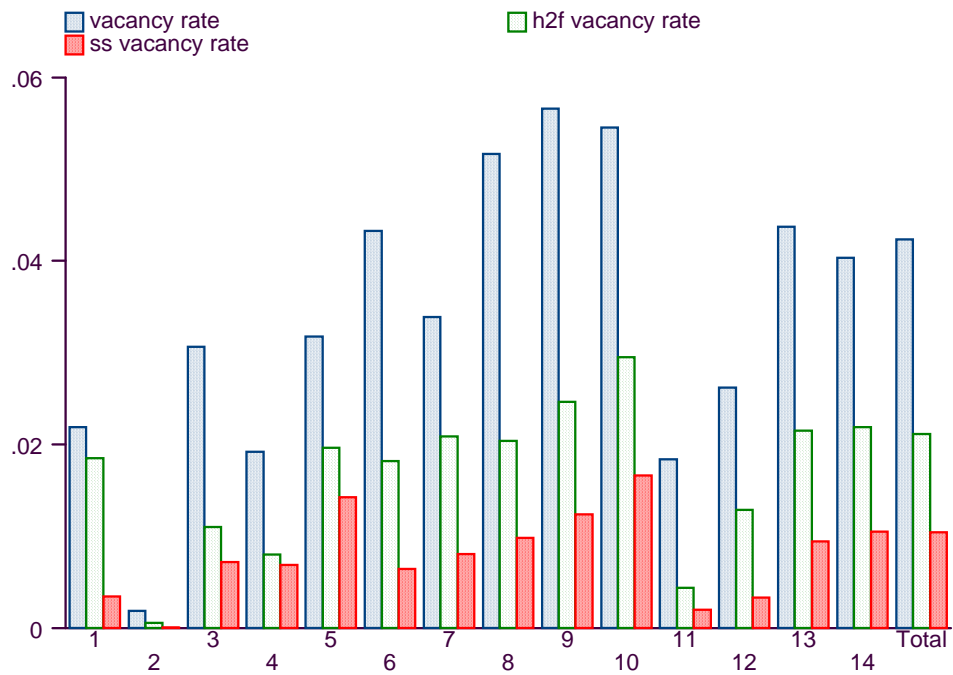
Figure 6B

Vacancy Rate by Employment: Proportion of Unfilled Jobs by Industry
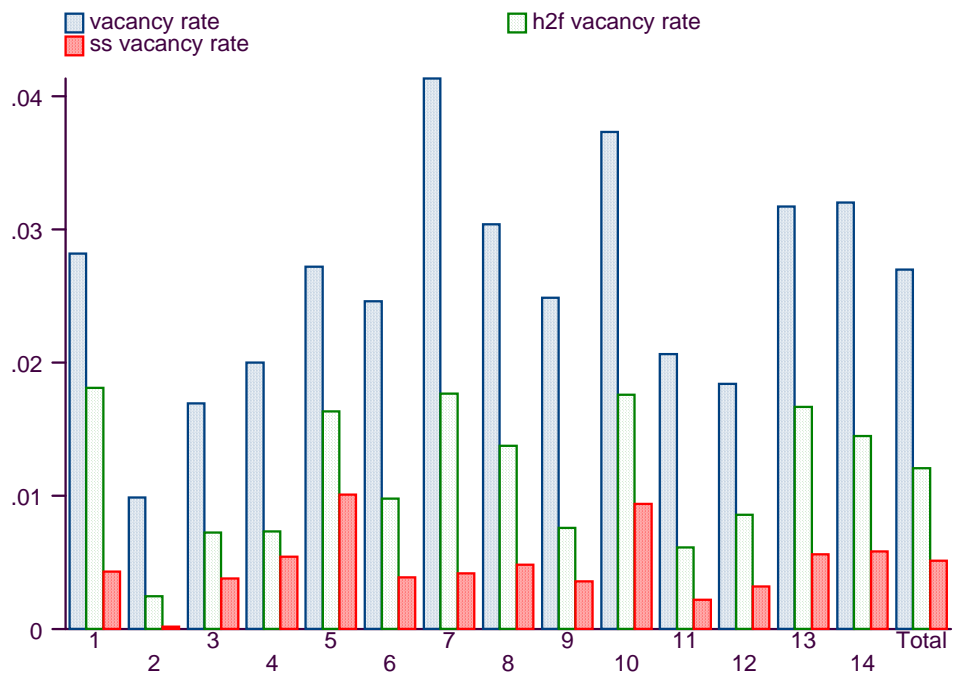
Key:

1 agriculture	5 construction	9 finance	13 health & social work
2 mining & quarrying	6 wholesale, retail	10 business services	14 other community
3 manufacturing	7 hotels and restaurants	11 public administration	
4 elect'y & water supply	8 transport & comm.	12 education	

58

Figure 7A

Vacancy Rate by Establishment: Proportion of Unfilled Jobs by Sector

Figure 7B

Vacancy Rate by Employment: Proportion of Unfilled Jobs by Sector

59

Figure 8A

Vacancy Rate by Establishment: Proportion of Unfilled Jobs by Size
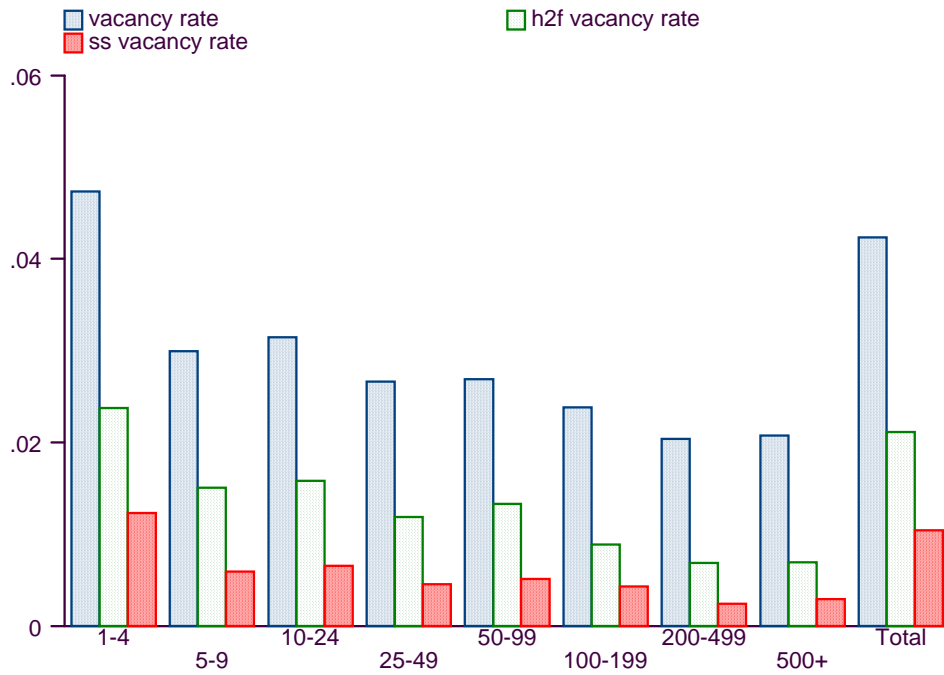

Figure 8B

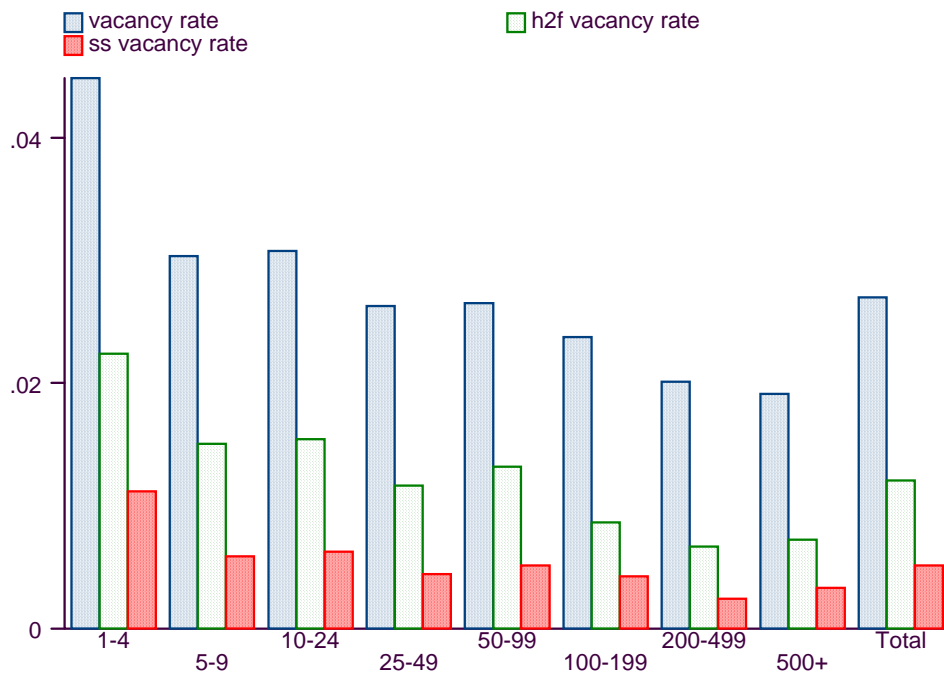**Vacancy Rate by Employment: Proportion of Unfilled Jobs by Size**

Figure 9

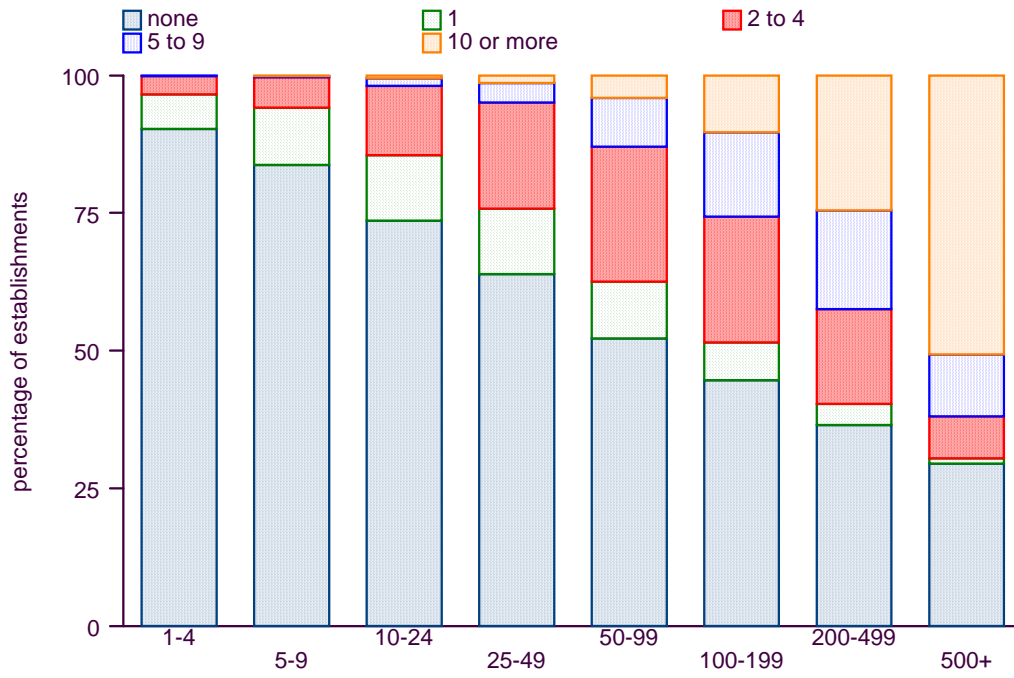**Number of Vacancies by Establishment Size: All Vacancies**

Figure 10A

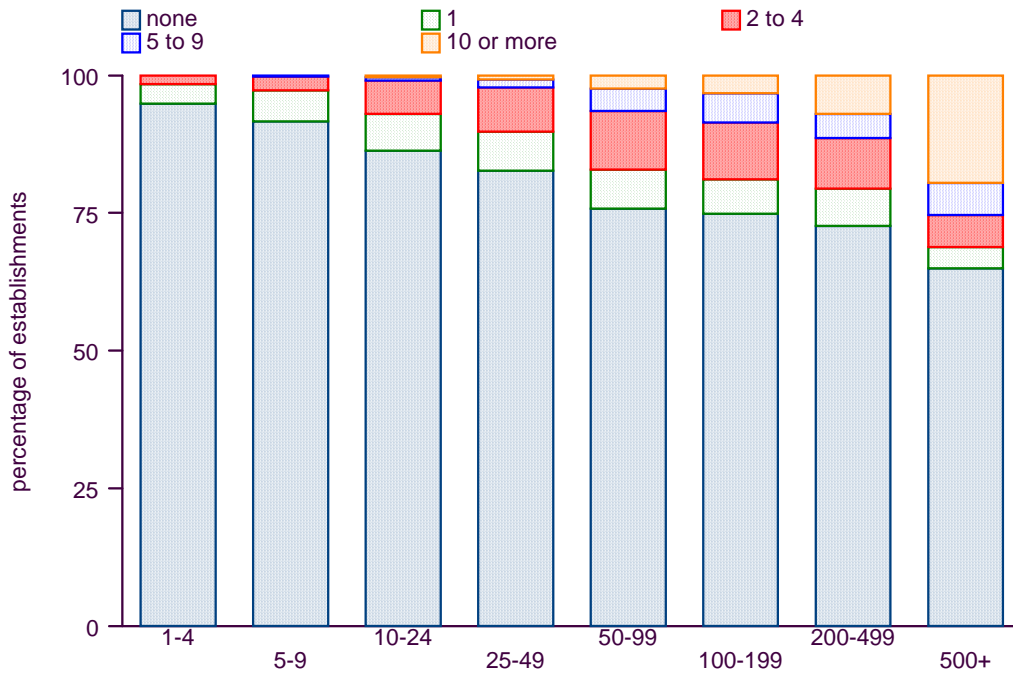**Number of Vacancies by Establishment Size: Hard-to-Fill Vacancies**

Figure 10B

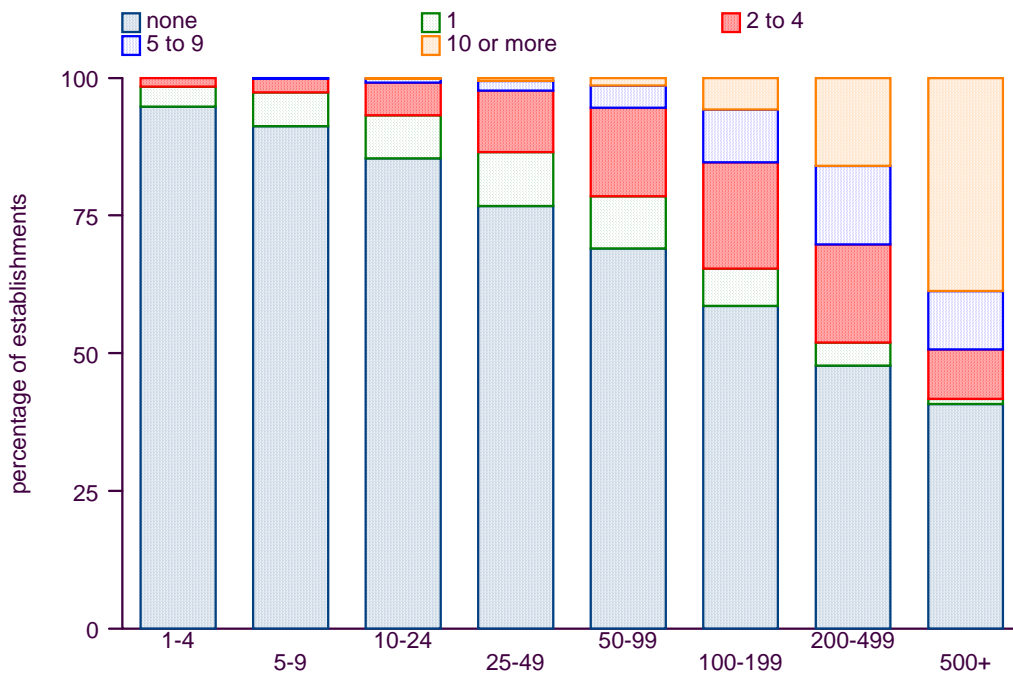**Number of Vacancies by Establishment Size: Non-Hard-to-Fill Vacancies**

Figure 11A

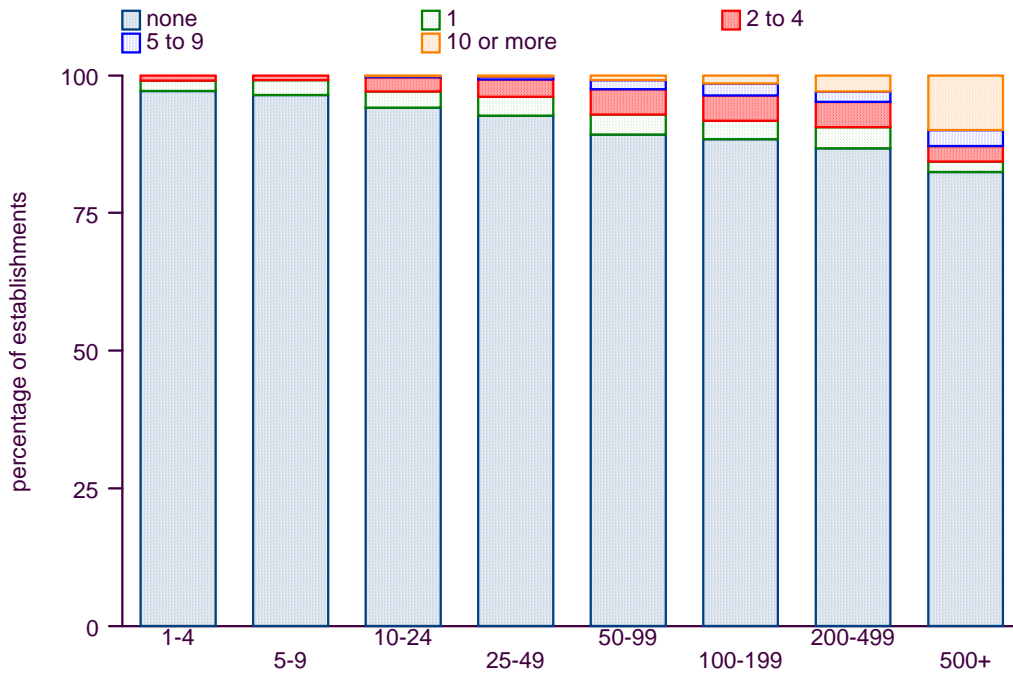**Number of Vacancies by Establishment Size: Skill-Shortage Vacancies**

Figure 11B

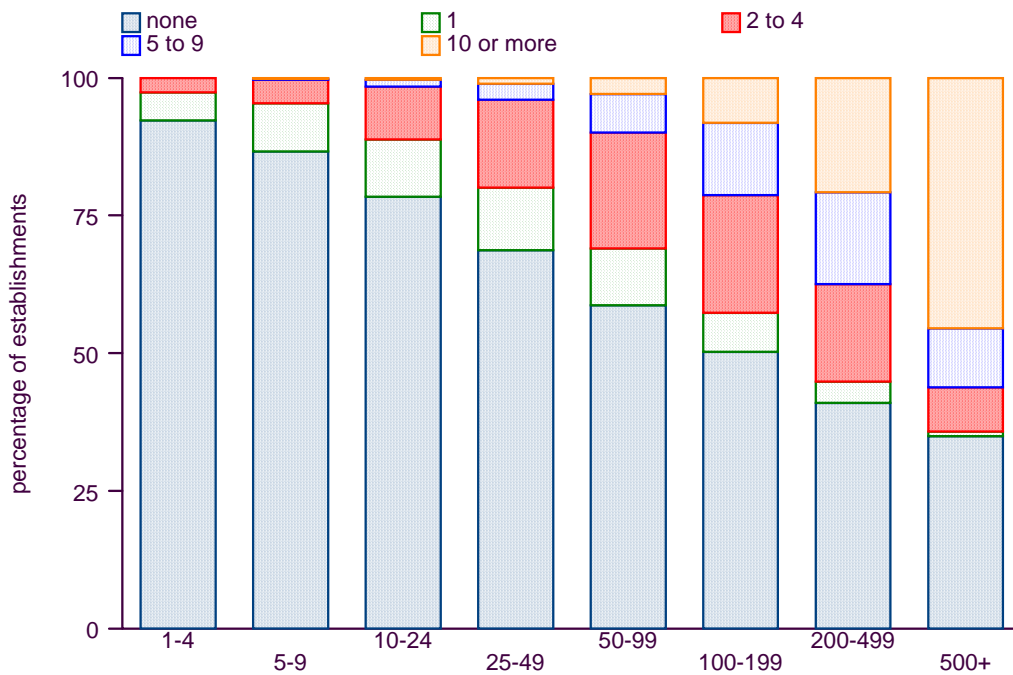**Number of Vacancies by Establishment Size: Non-Skill-Shortage Vacancies**

Figure 12

Notified Vacancies and ILO Unemployment in the UK: January 1990-April 2001
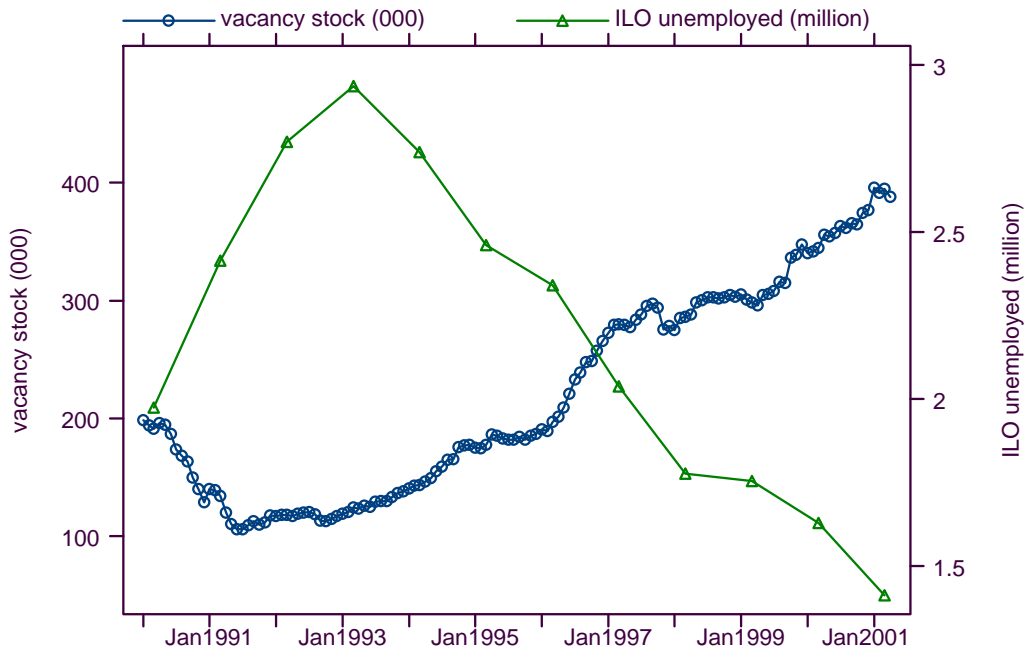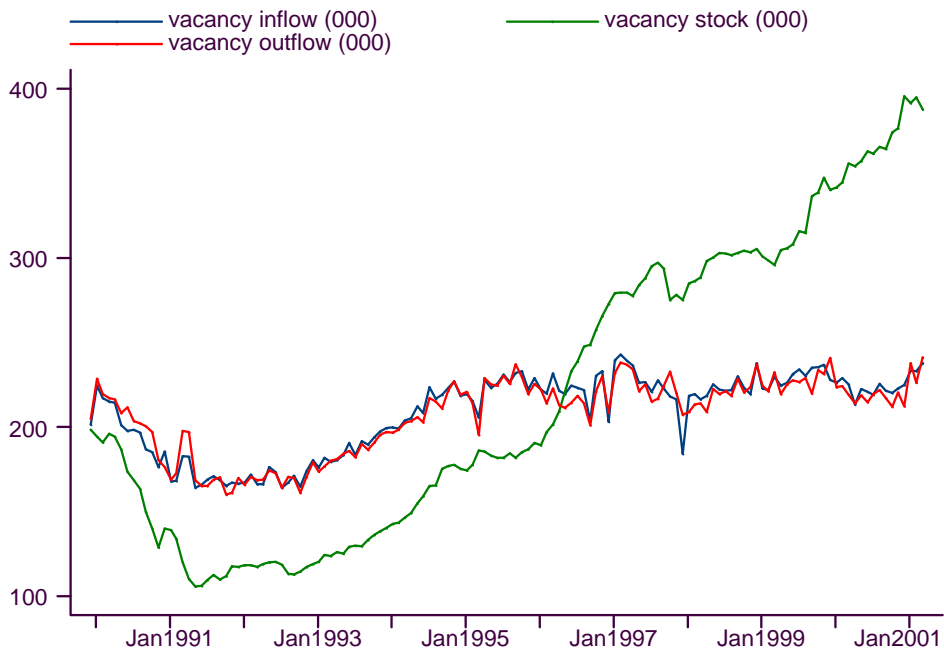

Figure 13

Vacancy Inflow, Vacancy Outflow and Vacancy Stock: January 1990-April 2001

Source:
1.   Vacancy stock, vacancy inflow, vacancy outflow: Employment Service administrative system, monthly, seasonally adjusted.
2.   ILO Unemployment: LFS Spring Quarters, seasonally adjusted.

64

Annex A

A Comparison of Vacancy Rates and Vacancy Densities

As discussed in section 3.1.2, it is possible to define (at least) two different measures of vacancies expressed as a share: a vacancy rate, $V/(V+E)$, and a vacancy density, V/E. Clearly these are different – indeed, Green and Owen (2002) (and others who have used V/E as a measure of vacancy intensity) are careful to call the V/E measure a vacancy *density* since it clearly is not a *rate* or proportion as it is not bounded above by 100%. The two measures are indicative, but can give yield very different statistics, especially for small establishments as shown below. Hence there is some potential for confusion.

The case for using vacancy rate, $V/(V+E)$, as the establishment-level measure of vacancy intensity is based on previous analyses of vacancies in the economics literature which have typically used this measure, and also its parallels with the calculation of unemployment rates for which the denominator in the calculation is the relevant population at 'risk'.

The case for using vacancy density, V/E, is strong on comparison grounds with previous analyses of ESS1999 and ESS2001 since V/E was used throughout. However, such comparisons are only strictly valid if the smallest establishments (1-4 employees) are excluded from the ESS2001 sample since these were not sampled in the ESS1999. Including these small establishments makes large differences to the calculated vacancy density measure as shown below. These small establishments dominate the population - they comprise 72% of the population of all establishments although only 11% of employment as shown in Table 1. In contrast, the vacancy rate measure is much less sensitive to the inclusion of the smaller establishments.

When $V \ll E$ (i.e. large E and/or small V), both measures give a very similar picture of vacancies. However, when E is small, then large differences between the two measures become evident for both unconditional and conditional (i.e. $V > 0$) measures, irrespective of whether densities/rates are weighted by establishment or employment (although the differences are rather smaller for the employment weighted measures as expected).

Table A1 illustrates the divergences in vacancy densities and vacancy rates by establishment size for all establishments, and also for those reporting at least one vacancy (i.e. conditional on having some vacancies). Statistics are weighted by establishment in Panel A and by employment in Panel B.

- Weighted by establishments (Panel A), mean vacancy density is 9.7% whereas the mean vacancy rate is 4.2%. The divergence derives mainly from establishments with 1-4 employees, for which the vacancy density is 11.9% but the vacancy rate is only 4.7%. As shown in the final two rows of Panel A, the conditional vacancy density and vacancy rate differ by a far larger degree (since most establishments do not have any vacancies). For the very smallest establishments, there are more vacancies than employment, so the density is greater than 100%.
- Weighted by employment (Panel B), mean vacancy density is 3.7% whereas the mean vacancy rate is 2.7%. These are more similar than in Panel A since

the smaller establishments are now less heavily weighted (although once again, the difference between the two measures is most evident for the smallest establishments for which the density is 10.2% while the rate is only 4.5%). The conditional vacancy density and vacancy rate are also more similar, at 8.5% and 6.1% respectively, than in Panel A because larger establishments are proportionately more likely to have at least one vacancy, and these dominate employment whereas they comprise the minority of establishments.

In this report, the preference for using the vacancy rate rather than the vacancy density measure stems from the fact that the analysis is at the establishment level (rather than in terms of employment) and includes all establishments, including the smallest. As shown above, it is precisely this combination which produces the greatest differences between the two measures, including densities in excess of 100%.

In order to make direct comparisons with ESS1999, then the smaller establishments must be omitted. The final column of Table A1 gives the averages conditional on employment of 5 or more. As expected, omitting the smaller establishments produces considerable convergence between the average vacancy rate and average vacancy density measures, particularly when weighted by employment.

Given that the LLSC-level analysis by Green and Owen (2002) has large E, the differences between vacancy rate and density measures at the LLSC level are small. Corresponding to the average vacancy density they report of 3.7%, the average vacancy rate is 2.7% as shown in the table.

To reiterate, the differences mainly stem from the smaller establishments, which while small in terms of employment, dominate in terms of the number of establishments and therefore produce large differences between vacancy density and vacancy rates especially when using the establishment-weighted statistics. When the small establishments are excluded as in the final column, there is much greater correspondence between the measures, especially in aggregate.

Table A1

Vacancy Incidence, Employment, Vacancy Rates and Vacancy Densities

	Establishment Size									
	1-4	5-9	10-24	25-49	50-99	100-199	200-499	500+	All	All ≥ 5
Panel A **By establishment:**										
Percentage reporting some vacancies	9.7	16.3	26.4	36.1	47.8	55.4	63.5	70.5	14.5	26.9
Mean employment	1.51	6.47	15.3	33.9	65.4	133.3	295.0	1097	10.00	31.77
Mean number of vacancies	0.15	0.27	0.62	1.05	1.98	3.60	6.37	22.50	0.373	0.94
Mean number of vacancies for those with some vacancies	1.59	1.65	2.35	2.91	4.14	6.51	10.0	31.9	2.57	3.47
Mean overall vacancy density V/E %	11.9	4.1	4.3	3.1	3.1	2.7	2.2	2.3	9.7	3.9
Mean overall vacancy rate V/(V+E) %	4.7	3.0	3.1	2.7	2.7	2.4	2.0	2.1	4.2	2.9
Mean vacancy density V/E for those with some vacancies %	123.2	25.3	16.2	8.7	6.4	4.9	3.4	3.2	66.6	14.5
Mean vacancy rate V/(V+E) for those with some vacancies %	48.8	18.3	11.9	7.4	5.6	4.3	3.2	2.9	29.1	10.9
Panel B **By employment:**										
Percentage reporting some vacancies	10.4	16.9	27.5	36.5	48.2	56.1	64.2	71.4	44.2	48.3
Mean employment	1.91	6.74	16.6	35.2	68.3	138.7	316.1	1877	371.0	415.9
Mean number of vacancies	0.16	0.28	0.64	1.07	2.03	3.73	6.76	34.13	7.26	8.12
Mean number of vacancies for those with some vacancies	1.55	1.66	2.32	2.94	4.21	6.66	10.5	47.8	16.43	16.82
Mean overall vacancy density V/E %	10.2	4.2	4.1	3.1	3.0	2.7	2.2	2.1	3.7	2.9
Mean overall vacancy rate V/(V+E) %	4.5	3.0	3.1	2.6	2.7	2.4	2.0	1.9	2.7	2.5
Mean vacancy density V/E for those with some vacancies %	98.5	24.6	14.8	8.5	6.3	4.8	3.4	2.9	8.5	6.1
Mean vacancy rate V/(V+E) for those with some vacancies %	43.2	17.9	11.2	7.2	5.5	4.2	3.1	2.7	6.1	5.1

Table B1

Variable Descriptions and Summary Statistics

Variable:	Description:	mean	sd
any vacancies$	any vacancies at the establishment	0.1453	0.3524
any h2f vacancies$	any hard-to-fill vacancies at the establishment	0.0750	0.2633
any non-h2f vacs.$	any non-hard-to-fill vacancies at the establishment	0.0835	0.2766
any ss vacancies$	any skill-shortage vacancies at the establishment	0.0371	0.1891
any non-ss vacs.$	any non-skill-shortage vacancies at the establishment	0.1192	0.3241
vr all	vacancy rate, all vacancies	0.0423	0.1347
vr h2f	vacancy rate, hard-to-fill vacancies	0.0211	0.0964
vr non-h2f	vacancy rate, non-hard-to-fill vacancies	0.0212	0.0930
vr ss	vacancy rate, skill-shortage vacancies	0.0105	0.0665
vr non-ss	vacancy rate, non-skill-shortage vacancies	0.0312	0.1127
est. size 1-4$	establishment size 1-4 (base)	0.7195	0.4493
est. size 5-9$	establishment size 5-9	0.1106	0.3136
est. size 10-24$	establishment size 10-24	0.0986	0.2982
est. size 25-49$	establishment size 25-49	0.0369	0.1885
est. size 50-99$	establishment size 50-99	0.0202	0.1406
est. size 10-199$	establishment size 100-199	0.0075	0.0864
est. size 200-499$	establishment size 200-499	0.0053	0.0727
est. size 500+$	establishment size 500+	0.0014	0.0376
private sector$	private sector	0.8570	0.3501
foreign owned$	foreign or joint UK/foreign owned	0.0328	0.1386
single$	single establishment organisation	0.7252	0.4464
increase in sales$	total sales/budget increased a great deal in last year	0.1242	0.3299
decrease in sales$	total sales/budget decreased a great deal in last year	0.0514	0.2207
hire rate	number hired in last year as fraction of workforce	0.3230	0.7082
quit rate	number left in last year as fraction of workforce	0.2969	0.7277
training 1-20%$	no off-the-job training in last year (base)	0.6296	0.4836
training 20-80%$	off-the-job training for 1-20% of employees in last year	0.0876	0.2827
training 80-100%$	off-the-job training for 20-80% of employees in last year	0.1114	0.3146
head office$	off-the-job training for 80-100% of employees in last year	0.1646	0.3709
LLSC industry empl.	establishment is head office of multi-establishment firm	0.0700	0.2551
LLSC low skills	LLSC share of industry employment: source LFS	0.1237	0.0706
LLSC high skills	LLSC proportion of working age with no qualifications	0.1542	0.0377
LLSC empl. growth	LLSC proportion of working age with NVQ4+	0.2376	0.0555
LLSC relative wage	LLSC employment growth in last 2 years: source ABI	0.0291	0.0485
ND_participation	LLSC weighted relative wage: source NES/LFS	1.0144	0.1486
ND_efficacy	LLSC ND participation: ND participants as % total unempl.	0.3864	0.0452
LLSC log(ilo_urate)	LLSC ND efficacy: jobs as a proportion of ND participants	0.3069	0.0431
log(ilo_urate)	log of LLSC ILO unemployment rate	1.5515	0.3698
log(urate)	log of LLSC claimant count unemployment rate	1.0725	0.4615
log(lturate)	log of LLSC long-term (> 6 months) unemployment rate	0.0484	0.5827
log(nonempr)	log of LLSC working age non-employment rate	3.1910	0.2002
industry dummies$	14 industry dummies	-	-

Notes:
1. All statistics are establishment-weighted.
2. $ denotes dummy variable.

Annex C

Green and Owen (2002) Classification of LLSCs

Group A:
High vacancies and high unemployment

	urate	vinc	vrate
North West LLSC	5.2	0.11	0.04
Lancashire LLSC	5.1	0.18	0.04
Birmingham & Solihull LLSC	9.3	0.34	0.14
Central London LLSC	8.3	0.18	0.07
East London LLSC	8.2	0.18	0.08
Devon and Cornwall LLSC	4.8	0.17	0.03
Average rates for Group A:	*7.44*	*0.186*	*0.070*

Group C:
Low vacancies and low unemployment

	urate	vinc	vrate
Cheshire-Warrington LLSC	3.6	0.10	0.02
Shropshire LLSC	4.1	0.10	0.02
Coventry and Warwick LLSC	4.9	0.12	0.02
North Yorkshire LLSC	4.1	0.09	0.02
Lincolnshire LLSC	4.2	0.09	0.02
Northamptonshire LLSC	3.8	0.21	0.04
Leicestershire LLSC	4.5	0.14	0.02
Derbyshire LLSC	4.5	0.07	0.01
Norfolk LLSC	4.8	0.10	0.02
Suffolk LLSC	4.3	0.12	0.01
South London LLSC	4.4	0.10	0.01
Kent and Medway LLSC	4.6	0.08	0.01
Somerset LLSC	3.9	0.07	0.02
Avon LLSC	3.8	0.25	0.03
Average rates for Group C:	*4.22*	*0.098*	*0.018*

Group B:
High vacancies and low unemployment

	urate	vinc	vrate
Staffordshire LLSC	4.4	0.16	0.05
Hereford and Worcester LLSC	4.6	0.13	0.03
Bedfordshire LLSC	4.3	0.23	0.07
Essex LLSC	3.6	0.17	0.07
Cambridgeshire LLSC	3.0	0.14	0.02
Hertfordshire LLSC	2.2	0.20	0.08
Surrey LLSC	2.4	0.30	0.08
EW Sussex and Brighton LLSC	3.4	0.16	0.04
Oxfordshire etc LLSC	2.6	0.23	0.07
Hampshire, IoW etc LLSC	3.3	0.12	0.04
Bracknell etc LLSC	2.5	0.27	0.06
Gloucestershire LLSC	4.2	0.17	0.06
Bournemouth etc LLSC	3.1	0.18	0.05
Wiltshire and Swindon LLSC	3.3	0.34	0.11
Average rates for Group B:	*3.32*	*0.178*	*0.054*

Group D:
Low vacancies and high unemployment

	urate	vinc	vrate
Mersyside-Halton LLSC	8.5	0.16	0.04
Greater Manchester LLSC	5.4	0.12	0.02
Tyne and Wear LLSC	9.2	0.12	0.04
County Durham LLSC	5.1	0.16	0.03
Tees Valley LLSC	9.2	0.10	0.01
Northumberland LLSC	4.9	0.10	0.01
The Black Country LLSC	7.1	0.14	0.03
South Yorkshire LLSC	6.8	0.16	0.02
West Yorkshire LLSC	6.1	0.11	0.03
Humberside LLSC	5.8	0.07	0.02
Nottinghamshire LLSC	5.2	0.22	0.08
North London LLSC	7.1	0.15	0.06
West London LLSC	6.0	0.13	0.03
Average rates for Group D:	*6.52*	*0.131*	*0.036*

Notes:
1. *urate* is the unemployment rate as measured by the LLSC ILO rate; *vinc* is the proportion of establishments with any vacancies; *vrate* is the average establishment level vacancy rate.
2. Statistics are weighted by establishment. See text for details.