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JOB COMPETITION AND THE WAGE CURVE

Simonetta Longhi

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ABSTRACT

The 'wage curve' literature consistently finds a negative relationship between regional unemployment rates and regional wages; the most widely accepted explanations are efficiency wage and labour turnover costs theories in which the unemployment rate is a measure of job competition. Since it fails to correctly measure labour supply and demand, however, the unemployment rate is likely to be an imprecise measure of job competition.

This paper estimates wage curves using different measures of job competition. The results suggest that efficiency wage and labour turnover costs theories do not seem to offer satisfactory explanations of the wage curve phenomenon.

NON-TECHNICAL SUMMARY

A large empirical literature estimates the relationship between the local unemployment rate and local wages, the so-called 'wage curve'. This literature, mostly initiated with the book by Blanchflower and Oswald (1994), generally finds that a doubling of the unemployment rate is associated to a roughly ten percent decrease in wages.

Despite the large empirical evidence on the existence of such a negative relationship between unemployment and wages, there is still lack of theoretical models explaining the wage curve phenomenon. One of the fundamental hypotheses of the theoretical explanations of the wage curve is that the local unemployment is a measure of job competition, of how difficult it is for workers to find a (new) job if they quit or are fired. Nevertheless, there are various reasons why the local unemployment rate is likely to be an imprecise measure of job competition. First, it assumes that workers with different levels of education and experience are close substitutes; second it neglects the possibility that a number of workers might hold a temporary job or might be dissatisfied with their current job, and might therefore engage in on-the-job search.

This paper uses data from the UK Labour Force Survey (LFS) over the period 1997-2005 to test whether the negative relationship between local wages and the measure of job competition is robust to changes in the way job competition is measured. Measures based only on the regional unemployment rate are compared to more complete measures accounting for on-the-job search, changes in labour demand, as well as accessibility of the local labour market. The results are clearly supportive of a wage curve only when job competition is measured by the unemployment rate. When job competition is measured by the ratio of the supply to the demand of labour, the estimated wage impact of job competition becomes positive and statistically significant, thus suggesting that wages are comparatively higher in those local labour markets where job competition is higher. These results suggest that the theoretical explanations of the wage curve that interpret the unemployment rate as a measure of job competition might not offer a satisfactory interpretation of the wage curve phenomenon, and that alternative theoretical explanations should give a different interpretation to the unemployment rate.

Blanchflower, D.G. and Oswald, A.J. (1994) *The Wage Curve*. Cambridge, MIT Press.

1. Introduction

The large empirical literature on the Blanchflower and Oswald's (1994b) wage curve consistently finds a negative relationship between regional unemployment rates and regional wages (see e.g. Blanchflower and Oswald, 2005; Nijkamp and Poot, 2005). Despite the large empirical evidence on the existence of the wage curve, there is still a lack of theoretical models explaining the phenomenon. This paper tests one of the fundamental hypotheses of the theoretical explanations of the wage curve, namely, that the local unemployment is a measure of job competition.

The most widely accepted explanations of the wage curve are efficiency wage and labour turnover costs theories (Card, 1995; Nijkamp and Poot, 2005). In the efficiency wage model it is costly for employers to monitor work effort of their employees, and firms will offer a wage premium to deter workers from shirking (Shapiro and Stiglitz, 1984). Since when caught shirking the worker is fired, the penalty for shirking is higher when it becomes harder to find a job. The threat of unemployment should act as a disciplinary device, and firms will offer a lower wage premium in periods of high unemployment. In the labour turnover costs model, firms economise the cost of hiring new workers by paying higher wages at times of tight labour markets to discourage existing workers from quitting (Campbell and Orszag, 1998). Clearly, in both theoretical models the unemployment rate is interpreted as a measure of job competition, of how difficult it is for workers to find a (new) job if they quit or are fired. The unemployment rate, however, assumes that workers with different levels of education and experience are close substitutes, and neglects the possibility that a number of workers might hold a temporary job or might be dissatisfied with their current job, and might therefore engage in on-the-job search.

It has been found that individuals who look for a job while working receive more job offers than the unemployed (Blau and Robins, 1990), and that in periods of 'high hiring' on-the-job search tends to increase and to reduce the outflow from unemployment (e.g. Burgess, 1993; Broersma, 1997; Eriksson and Lagerstrom, 2004). Pissarides and Wadsworth (1994) model the decision process leading to on-the-job search versus unemployed search and find that some groups of people engage in on-the-job search more than others (for example, on-the-job search is lower among workers in full-time jobs with long tenure). For these reasons, the unemployment rate is likely to be an imprecise measure of job competition in the local labour market; furthermore, the relationship between the unemployment rate and job

competition might vary in a complex way over the business cycle and across groups of people. This, however, is likely to be relevant only if the proportion of on-the-job – versus unemployed – search is high. According to the Labour Force Survey (LFS), in the UK in 2005 only 45 percent of people who are actively looking for a job are unemployed; 50 percent already have a job; while the remaining 5 percent are either self-employed, in government training programs or are unpaid family workers. The LFS also suggests that the proportion of on-the-job versus unemployed search is increasing over time (see Figure 1).

FIGURE 1 ABOUT HERE

If the efficiency wage and labour turnover cost theories are valid explanations for the wage curve, the negative relationship with wages should be robust to the inclusion of on-the-job search in the measure of job competition. Using data from the LFS for the UK over the period 1997-2005, this paper tests the robustness of the wage curve to different ways of measuring job competition. Measures based only on the regional unemployment rate are compared to more complete measures accounting for on-the-job search, changes in labour demand, as well as accessibility of the local labour market. The results are supportive of a wage curve only when job competition is measured by the unemployment rate, and when it is measured by the ‘search’ rate (the proportion of people in the labour force looking for a job). When job competition is measured by the ratio of the supply to the demand of labour, the estimated wage impact of job competition becomes positive and statistically significant. The wage curve relationship, therefore, does not seem to be robust to changes in the way of measuring job competition, thus suggesting that efficiency wages, labour turnover, and other theories interpreting the unemployment rate as a measure of job competition, might not offer a satisfactory interpretation of the wage curve phenomenon.

2. The Regional Unemployment Rate as a Measure of Job Competition

There are various reasons why the regional unemployment rate might not be a good measure of job competition in the local labour market. First, by relating wages to the total regional unemployment rate, the traditional specification of the wage curve assumes perfect substitutability of people with different experience and education. However, workers with similar education but different levels of experience are unlikely to be close substitutes, and

are therefore unlikely to be in competition with each other (Welch, 1979; Card and Lemieux, 2001); skill-specific unemployment rates should be a better predictor of group-specific wages than the average regional unemployment rate (Card, 1995). This is particularly important when regional data are used: since workers tend to cluster geographically by skills (e.g. Combes et al., 2006), the relationship between wages and the regional unemployment rate might partly be due to composition effects.

Nevertheless, maybe because of lack of data on group-specific unemployment rates, most wage curve estimations still relate wages to the total regional unemployment rate (see e.g. Nijkamp and Poot, 2005). Kennedy and Borland (2000) are one interesting exception: in their estimation of the wage curve for Australia they find that disaggregating the unemployment rate either by age, education, industry or occupation, reduces the coefficient of unemployment in the wage regression. Although the coefficient remains consistently negative, it is statistically significant only when the unemployment rate is disaggregated by education.

Second, the unemployment rate neglects all people who search for a job but are not registered as unemployed. Pannenberg and Schwarze (1998) estimate a wage curve for Germany including in their measure of job competition people who participate in labour market training programs. Workers participating in such training programs, they argue, are in fact looking for a job, but are not included in the official unemployment statistics. Although in the short run workers participating in training programs seem to have a lower probability of re-employment than unemployed not participating in any program (Lechner et al., 2006), Pannenberg and Schwarze (1998) find that their new measure of job competition yields the estimation of wage impacts that are bigger than the ones obtained when the unemployment rate is used.

In the UK, the unemployed and people participating in training programs account for only half of those who are actively looking for a job; the other half of job-seekers are already employed. For the UK, a correct measure of job competition should therefore also include on-the-job search.

The third criticism to the unemployment rate as a measure of job competition is that, being computed at the regional level, it considers regions as separate entities thus neglecting possible spatial relationships: job competition in the neighbouring regions is assumed to have no effect on local wages (Longhi et al., 2006). Such misspecification is sometimes corrected in the literature by means of spatial lag or spatial error models (e.g. Buettner, 1999; Elhorst et

al., 2007). Rather than adding a spatial lag as a separate explanatory variable, in this paper spatial correlation is directly included in the measure of job competition by weighting the regional measure of job competition by (rescaled) interregional commuting flows. Job competition in other labour markets are all taken into account, and neighbouring labour markets where the worker is likely to commute are given higher weight than distant ones, where the worker is unlikely to commute to work.

Below, the wage curve is estimated using different measures of job competition, which take into account these criticisms.

3. Data and Empirical Results

3.1. The Dataset

The data used in this analysis is the quarterly LFS for the UK from 1997 to 2005. The wage equations focus on workers in working age, employed in the private sector, and who earn between £2 and £100 per hour. Although individuals are interviewed for five successive quarters, data on wages are collected only in one or at most two interviews (Office for National Statistics, 2003); to avoid problems of almost perfect correlation across wages of one individual, this analysis uses only wage data collected from the first interview. The data identifies 19 regions of residence and of work, thus allowing the computation of interregional commuting flows.

In addition to this geographical dimension, local labour markets are also identified by years of potential experience and by education. Years of potential experience are computed as the actual age minus the age at which full time education has been completed; and are then divided into four groups: 0-5 years; 6-15 years; 16-30 years; and more than 30 years. Such groups should reduce the problem that potential experience might be over-estimated for women, who are more likely than men to have career interruptions.

Individuals are also grouped into four broad education levels on the basis of the highest qualification obtained (q). Individuals with first order degrees, higher degrees, and other degrees are included in the first group, while individuals with diplomas in higher education, teaching, nursing and other diplomas are included in the second group. Individuals with A-levels are in the third, and those who only completed compulsory

education are in the fourth group.¹ Occupations are defined as the major groups of the 1990 Standard Occupations Classification, while industries are defined as the major divisions of the 1980 Standard Industrial Classification (see Office for National Statistics, 2003, Vol. 5 for more details).

The LFS also collects information on whether the respondent is actively looking for a job. Since the question is asked to both the unemployed and workers who already have a job, labour supply is computed here as the number of persons – either unemployed, employed, self-employed, participating in government training programs, or unpaid family workers – who are actively looking for a job. The LFS also provides data on the month and year in which each worker started his/her current job; the number of workers hired each quarter is used as a proxy for the number of vacancies (labour demand) in the previous quarter. This is preferred to the use of direct data on the stocks and flows of vacancies notified by employers to job centres: since low-skill jobs are more likely than high-skill jobs to be notified to the job centres, such data would offer measures of labour demand that underestimate demand for jobs requiring higher skills. In the sensitivity analysis in Sub-section 3.4 vacancies data from job centres will be used without significantly altering the general conclusion of the analysis based on LFS data.

3.2. The ‘Traditional’ Wage Curve

The wage curve is essentially a Mincer regression in which the regional unemployment rate appears among the explanatory variables (Blanchflower and Oswald, 1994a):

$$\ln w_{it} = \alpha + \beta \ln JobCompetition_{rt} + \mathbf{X}_{it} \gamma + \mathbf{Q}_{it} + \mathbf{O}_{it} + \mathbf{I}_{it} + \mathbf{W}_{it} + \mathbf{T} + \varepsilon_{it} \quad (1)$$

The dependent variable is the log of hourly wages of individual i (recorded at time t : w_{it}), and the explanatory variable of interest is the log of the measure of job competition in region r at time t (the regional unemployment rate U_{rt} in the original specification of the wage curve). The vector \mathbf{X}_{it} includes age, years of education, years of tenure in the job, years of potential experience, a dummy for women, one for part-timers, and a dummy for whether married. \mathbf{Q}_{it} are dummies for the highest qualification; \mathbf{O}_{it} for the occupation, and \mathbf{I}_{it} are dummies for the

¹ It might be argued that the choice of four qualification and four potential experience groups, although mostly dictated by data availability, is somewhat subjective. However, the wage curve can be correctly replicated

industry in which individual i is employed at time t . \mathbf{W}_{it} are dummies for the region where the job is located, while \mathbf{T} are dummies for year and quarter of the interview.

The regional unemployment rate is computed here from the LFS by dividing the number of unemployed by the number of individuals in the active population.² The regional unemployment rate ranges from a minimum of 2.86 percent in 2003 in the South West, to a maximum of 11.74 percent in Merseyside in 1998, with a mean of 5.60 and a standard deviation of 1.75 (see Table 1).

TABLE 1 ABOUT HERE

The results of the estimation of equation (1) are shown in the first column of Table 2, and separate results by gender are shown in Table 3. Following the literature, the measure of job competition is instrumented by its one-quarter lag, and the standard errors are corrected for within-group correlation (Moulton, 1990).

In line with the wage curve literature, the results in Table 2 show a negative impact of regional unemployment on individual wages; the elasticity is -0.302, although it is not statistically significant. When computed only on women the coefficient is -0.388, while when computed only on men the coefficient is -0.156, suggesting that, for men, a doubling in the unemployment rate is associated with wages that are around fifteen percent lower (Table 3). Although not statistically significant, these results are broadly in line with previous studies investigating wage curves for Britain (e.g. Blanchflower and Oswald, 1994a; Black and FitzRoy, 2000; Bell et al., 2002; Johnes, 2007).

TABLE 2 ABOUT HERE

TABLE 3 ABOUT HERE

given the classification chosen. A sensitivity analysis to changes in the classification is partly undertaken in Sub-section 3.4.

² The active population is measured as the sum of the number of employees, self-employed, workers participating in government training programs, unpaid family workers, and unemployed. All measures of job competition are computed taking into account ‘person-weights’ (see Office for National Statistics, 2003). To avoid small-cell size problems, those experience-qualification-region cells including less than ten individuals have been dropped.

3.3. Alternative Ways to Measure Job Competition

The first criticism to the regional unemployment rate as a measure of job competition is its assumption of perfect substitutability across workers with different skills. The first alternative measure of job competition proposed here consists of group-specific unemployment rates:

$$Ur_{eqrt} = \frac{U_{eqrt}}{AP_{eqrt}} \quad (2)$$

where U_{eqrt} is the number of individuals in experience group e and with qualification q living in region r who are unemployed at time t . AP_{eqrt} is the number of individuals in experience group e and with qualification q living in region r in the active population at time t . As expected, the group-specific unemployment rate shows a bigger variability than the national unemployment rate. The group-specific unemployment rate is zero percent in those qualification-experience-region cells in which none of the persons interviewed is unemployed; these are seven percent of all the cells. The maximum is 38.71 percent, with a mean of 4.86 and a standard deviation of 3.94 (Table 1).

The results of the estimation of equation (1) using the group-specific unemployment rates as a measure of job competition are shown in column (2) of Tables 2 and 3.³ In line with the findings by Kennedy and Borland (2000) the regression coefficient of the group-specific unemployment rates are still negative, but lower than the coefficient of the regional unemployment rate in column (1). Furthermore, both Table 2 and Table 3 show regression coefficients for the group-specific unemployment rate that are remarkably close to the negative 0.10 advocated by Blanchflower and Oswald (2005).

The second criticism to the unemployment rate as a measure of job competition is its neglect of on-the-job search, and its assumption that only unemployed people look for a job. There are different ways to include on-the-job search in the measure of job competition. The easiest way consists in the computation of a search rate similar to Pannenberg and Schwarze (1998):

³ To avoid observations from dropping out of the regression, a value of 0.1 percent is used when the measure of job competition would otherwise be exactly zero. Dropping these observations does not change the overall conclusions of this paper.

$$SR_{eqrt} = \frac{S_{eqrt}}{AP_{eqrt}} = \frac{U_{eqrt}}{AP_{eqrt}} + \frac{E_{eqrt} + O_{eqrt}}{AP_{eqrt}} \quad (3)$$

where S_{eqrt} measures supply of workers with qualification q and potential experience e living in region r at time t . This equals the sum of unemployed (U_{eqrt}), employed (E_{eqrt}), and others (O_{eqrt} i.e. self-employed, people in government training programs and unpaid family workers) who are actively looking for a job.

The search rate has a minimum of zero percent in those qualification-experience-region cells in which none of the persons interviewed is actively looking for a (new) job; these are 0.7 percent of all cells. The maximum of the search rate is 50.29 percent; its mean 10.90 percent, and its standard deviation 5.58 (see Table 1), while its correlation with the group-specific unemployment rate is 0.814.

When the natural log of the ‘non-unemployed job seekers’ rate (the second term of equation 3) is included among the explanatory variables, the log unemployment rate has a coefficient close to -0.10, always statistically significant, while the coefficient of the log non-unemployed job seekers rate is positive but not statistically significant. This clearly supports the existence of a wage curve, and might suggest that no bias to the coefficient of the unemployment rate is generated by omitting those job seekers that are not unemployed. However, this way of measuring job competition would neglect the possible interactions between, for example, on-the-job search and the unemployment rate (see e.g. Burgess, 1993). The wage impact of the search rate S_{eqrt} is empirically more interesting when it is included in the regression as a single index. The results of the estimation of equation (1) using the search rate as a measure of job competition are shown in column (3) of Tables 2 and 3. Consistently with the finding of Pannenberg and Schwarze (1998), adding people engaging in on-the-job search to the number of unemployed increases the estimated negative wage impact of job competition. Because in the UK the proportion of people engaging in on-the-job search and therefore – potentially – in competition with the unemployed is rather high, the increase in the estimated elasticity – especially for males – is substantial. The coefficients in Table 3 suggest now rather high marginal effects: a ten percent increase in the unemployment rate would reduce female wages by 4.88 percent and male wages by 18.34 percent.

While the regional unemployment rate suggests a bigger impact on wages of women, the search rate suggests a bigger impact on men. Furthermore, the gender difference computed by the search rate is much higher than the one suggested by the unemployment

rate. This suggests that failing to correctly measure all the component of job competition might also lead to incorrect gender comparisons.

The rather large wage impacts of the search rate might be due to the way it is computed. The search rate takes into account that in booming periods the number of people engaging in on-the-job search increases (e.g. Burgess, 1993), but it neglects the increase in labour demand, and that job-to-job transitions are also likely to have an impact on the number of vacancies. A correct measure of job competition should also take into account labour demand.

In the theoretical models of job search the arrival rate of job offers to workers is computed as the number of job matches divided by unemployment, while the arrival rate for the employers is computed as matches divided by vacancies. The arrival rate of job offers to workers is an increasing function of vacancies divided by unemployment (Pissarides, 1984; Mortensen, 2007). In the literature on wage posting the employer posts a wage given unemployment and wages offered by other employers; the length of the queue of workers applying for the job is measured by the ratio of unemployment to vacancies (Rogerson et al., 2005). This ratio is interpreted as the inverse of labour market tightness, a measure of job competition.

Since the unemployment rate is often interpreted as the difference between labour supply and demand, an alternative way to measure job competition consists in dividing the difference between labour supply and demand by the active population:

$$C_{eqrt} = \frac{S_{eqrt}}{AP_{eqrt}} - \frac{D_{eqrt}}{AP_{eqrt}} \quad (4)$$

where D_{eqrt} measures demand for workers with potential experience e and qualification q at time t . Again, S_{eqrt} measures labour supply and AP_{eqrt} is the active population. While in the measure of supply the subscript r refers to the region where the person lives, in the measure of demand it refers to the region where the job is. The index ranges between minus 1 and plus 1, increases following an increase in the supply, and decreases following an increase in the demand. Positive values indicate excess supply, while negative values indicate excess demand.

The mean and standard deviation of C_{eqrt} are 4.68 and 4.40, and are remarkably similar to the mean and standard deviation of the group-specific unemployment rate.

However, C_{eqrt} ranges from a minimum of minus 24.49 percent to a maximum of 37.76 percent. While the unemployment rates and the search rate all have distributions that are skewed to the left, the job competition measure is much more normally distributed. The overall correlation between the job competition measure and the group-specific unemployment rate is 0.564. Figure 2 plots the regional unemployment rate against the job competition measure of equation (4), and suggests that most of the correlation between the two measures is due to the correlation in the group of workers who only completed compulsory schooling.

FIGURE 2 ABOUT HERE

A useful feature of the job competition measure of equation (4) is that the difference between the logarithms of the two components of C_{eqrt} equals the logarithm of the ratio between labour supply and demand, commonly used in the above-mentioned job-search literature as a measure of job competition (e.g. Pissarides, 1985; Mortensen and Pissarides, 1994; Rogerson et al., 2005).

When the natural log of the supply and the natural log of the demand are included among the explanatory variables, the coefficient of the log supply (S_{eqrt}/AP_{eqrt} , which coincides with the search rate of equation (3)) is statistically insignificant, although it remains consistently negative. The coefficient of the log demand (D_{eqrt}/AP_{eqrt} , when the sign is inverted) is positive, often larger than the coefficient of the supply, and always statistically significant. The detailed results are not shown here, but are available upon request.

The wage impact of job competition C_{eqrt} is however easier to interpret – and empirically more interesting – when it is included in the regression as the log of the ratio of the supply to the demand. Admittedly, this choice imposes constraints on the coefficient of the different components of the measure of job competition, such constraints, however, are consistent with the theory. The results are shown in the fourth column of Tables 2 and 3, and are in this case inconsistent with a wage curve. The regression coefficients are now positive and statistically significant. Rather than suggesting a negative relationship between job competition and wages, the results suggest that wages tend to be higher in those local labour markets where job competition is higher: a 10 percent increase in job competition would increase wages of women by 6.17 percent, and wages of men by 8.08 percent.

The last measure of job competition proposed here takes into account job opportunities in other regions. Since distances and travel times are not available, a reasonable proxy for accessibility of the neighbouring labour markets can be obtained from commuting flows. The last measure of job competition, therefore, weights both supply and demand by commuting flows across regions; more accessible labour markets – identified by larger commuting flows – are given high weights, while less accessible labour markets – identified by small commuting flows – are given lower weights (see e.g. Longhi, 2007):

$${}^wC_{eqrt} = \frac{\sum_j {}^l\omega_{rj} S_{eqrt}}{AP_{eqt}} - \frac{\sum_j {}^o\omega_{rj} D_{eqrt}}{AP_{eqt}} \quad (5)$$

The supply is weighted by the flow of incoming commuters (${}^l\omega_{rj}$) to account for all those workers who might compete for jobs available in the region: the supply in the neighbouring regions increases supply in region r in a way which is proportional to the flow of workers commuting to the region. Similarly, the demand is weighted by the flow of outgoing commuters (${}^o\omega_{rj}$) to account for all those vacancies that might be available for residents of the region: the demand in the neighbouring regions increases the possibility of residents to find a suitable job within a reasonable commuting distance.

Since the flows of commuters seem to be rather stable over time, the weights are computed using the average number of commuters over the whole period. Supply in the own region, and jobs which are available in the region of residence are given weight equal to one. The remaining weights are computed as the number of commuters rescaled by the number of workers who live and work in the region. The maximum inter-regional incoming-commuters weight is equal to 0.291 for commuters from the Rest of the South East to London; while the maximum inter-regional outgoing-commuters weight is equal to 0.197 for commuters from the Rest of West Midlands to West Midlands Metropolitan.

The weighted measure of job competition ${}^wC_{eqrt}$ has a lower variability than the unweighted measure C_{eqt} : ${}^wC_{eqrt}$ ranges from a minimum of minus 2.39 percent to a maximum of 4.55 percent, with a mean of only 0.41 percent and a standard deviation of only 0.48 (see Table 1). The correlation between the group-specific unemployment rate and the weighted measure of job competition is only 0.384. The distribution of the weighted measure of job competition is slightly skewed to the left, towards values of job competition very close to zero. Such a distribution of the job competition indicator might suggest equilibrium of

labour supply and demand across regional labour markets after accounting for commuting flows.

The wage curve estimation in which ${}^WC_{eqrt}$ is used as measure of job competition is in the fifth column of Tables 2 and 3. Again, the results suggest that job competition has a positive – rather than a negative – impact on wages, and is therefore inconsistent with the wage curve. The wage impact of job competition in the local labour market is remarkably similar for men and women, suggesting that a ten percent increase in job competition is associated to a 13 percent increase in wages.

3.4. Robustness Check

Since job-to-job transitions might not have an impact on the overall number of vacancies, an alternative measure of job competition can be computed by dividing unemployment by the number of vacancies (e.g. Rogerson et al., 2005). While the unweighted competition measure gives the same weight to the unemployed and to employed job seekers, this new measure would give zero weight to workers engaging in on-the-job search. The measure ranges from minus 29.54 percent to 26.39 percent, with a standard deviation of 4.48. The mean is 1.35 percent, only slightly higher than the mean of the weighted job competition measure but much smaller than the mean of the other indicators. The correlation with the group specific unemployment rate is 0.446, while the correlation with the unweighted measure of job competition is 0.717.

The results of the wage regression in which job competition is measured by the ratio of unemployment to vacancies are summarised in the last row of the first two columns of Table 4. This new measure of job competition shows a positive coefficient for men, but a negative coefficient for women. Both coefficients are economically small, and none of them is statistically significant, thus not giving any support to the wage curve.

Although the empirical literature on the wage curve usually instruments the measure of job competition by its lag, an alternative approach to reduce endogeneity problems consists in using the lagged – rather than contemporaneous – measure of job competition as explanatory variable, and estimating the model by OLS. The results are summarised in columns 3 and 4 of Table 4. The regional and the group-specific unemployment rates are still negative and statistically significant, while the search rate and the two measures of job competition are positive and often statistically significant. The ratio of unemployment to vacancies is negative but very close to zero and not statistically significant for women, while

it is positive and statistically significant for men. Also in this case there seems to be a wage curve only when the unemployment rate is used. All other ways of measuring job competition find no support for the wage curve.

TABLE 4 ABOUT HERE

To avoid problems of pro-cyclicality which might affect the job competition measures more than the unemployment rate, the wage curve can be estimated separately by years (the results are not shown here, but are available on request). Also in this case only the coefficient of the group-specific unemployment rate is consistently negative and statistically significant. While the search rate has a rather unstable coefficient, the weighted and unweighted measures of job competition generally have positive coefficients which, at times, are also statistically significant. The ratio of unemployment to vacancies is generally positive for men and negative for women, but never statistically significant.

The final robustness test is based on data for 2005 aggregated at the level of Local Authority Districts in Great Britain. Data on median weekly – rather than hourly – wages⁴ is collected from the New Earnings Survey, while estimates of regional unemployment rate are based on the Labour Force Survey for Local Areas. Data on vacancies notified by employers to Jobcentre Plus, the public employment service for Great Britain are supplied by the Department for Work and Pensions. All these data are available from the website of the Office of National Statistics. Given such a small amount of information, the only explanatory variables of the regressions shown in Table 5 are the log measure of job competition and its square. Log wages and log job competition are contemporaneous, and no attempt to correct for endogeneity is made here. Also, it is not possible to distinguish here between different experience and qualification groups. The models are estimated by OLS for wages of men and women separately.

While the first column of Table 5 uses the regional unemployment rate, as suggested by Blanchflower and Oswald, the second column uses the ratio of unemployment to vacancies (as in Table 4), to measure job competition as suggested by the job search literature.

⁴ It might be argued that weekly wages should be preferred to hourly wages since they should be less affected by measurement error.

TABLE 5 ABOUT HERE

Table 5 confirms the previous results: although there is a negative impact of the unemployment rate on wages, when job competition is measured by the ratio of unemployment to vacancies the coefficient becomes positive and statistically significant. Similar results are obtained when the four hundred Local Authority Districts are grouped in roughly one hundred Authority Units or into only eleven Government Office Regions.

4. Discussion

The positive regression coefficients of the last two measures of job competition are more consistent with the theory of compensating differentials (e.g. Harris and Todaro, 1970), than with the wage curve model.

The relationship between the wage curve and the theory of compensating differentials has been extensively discussed (e.g. Partridge and Rickman, 1997). Because the theory of compensating differentials assumes perfect mobility across local labour markets, it is often interpreted in terms of “long-run spatial equilibrium”. Since it assumes no mobility across local labour markets, the wage curve is normally interpreted as the “locus of intra-local labour market steady states” (Morrison et al., 2006), although Sato (2000) suggests that differentials in regional productivity and congestion costs allow for the existence of a wage curve also in case workers mobility. In their estimations of the wage curve Bell et al. (2002) find a positive impact of the unemployment rate on wages when they control for regional house prices which, they argue, identify a zero migration condition. The findings in Tables 2 to 5, however, cannot easily be interpreted in such a framework since the only difference between the models presented is the way job competition is measured.

In summary, the results in the previous sections suggest a negative relationship only between wages and the unemployment rate; when the measure of job competition is computed following search theoretical models the relationship with wages becomes positive. The positive coefficient is consistent with the job search literature on wage posting, where the employer posts a wage given search behaviour of workers and wages offered by other employers (Burdett and Mortensen, 1998). If the queue of job applicants is likely to be long (i.e. the number of job seekers is high), the worker will apply only if the wage posted is sufficiently high to compensate for the low probability of receiving the job offer, thus

generating a positive – rather than negative – relationship between job competition and wages (e.g. Rogerson et al., 2005). Alternatively, if better employer-employee matches increase productivity, a larger pool of applicants for the job would increase the probability of a good match, thus increasing the average quality of matches in the labour market and generating a positive relationship between job competition and wages. Since it gives no information on the average duration of unemployment, a higher unemployment rate would not necessarily be related to higher job competition and to better matches.

5. Conclusions

The most widely accepted explanations of the Blanchflower and Oswald (1994b) wage curve are efficiency wage and labour turnover costs theories in which the unemployment rate is a measure of how difficult it is for workers to find a (new) job (job competition). Since it fails to correctly measure labour supply and demand, however, the unemployment rate is likely to be an imprecise measure of job competition. Using data for the UK over the period 1997-2005, this paper tests the robustness of the wage curve to different ways of measuring job competition. Measures of job competition based only on unemployment are compared to more complete measures accounting for on-the-job search, changes in labour demand, and accessibility of the local labour market.

The results are strongly supportive of a wage curve, but only when job competition is measured by the unemployment rate. When job competition is measured by the ratio of the supply to the demand of labour the coefficient becomes positive and statistically significant. Since the wage curve relationship does not seem to be robust to changes in the way job competition is measured, we can conclude that efficiency wages, labour turnover, and other theories interpreting the unemployment rate as a measure of job competition might not offer a satisfactory interpretation of the wage curve phenomenon. Future research to suggest alternative theoretical explanations of the wage curve phenomenon should be based on a different interpretation of the unemployment rate.

Although the group-specific unemployment rate leads to a good replication of the wage curve phenomenon, the regression coefficients of the other measures of job competition might in certain cases be considered slightly large. Indeed, all measures of job competition have drawbacks. If the wage curve has to be interpreted as firms reactions to changes in workers behaviour following changes in the probability of re-employment, future research

should analyse the relationship between (local) wages and worker's perceptions on how easy it is to find a (new) job. Unfortunately, although such kinds of questions are sometimes asked to the unemployed, up to now they have never been asked to those who already are employed.

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TABLES AND FIGURES

Table 1: Descriptive statistics

Observations: 401425	Mean	Standard Deviation	Min	Max
Unemployment Rate	5.60	1.75	2.86	11.74
Skill-specific Unemployment Rate	4.86	3.94	0.00	38.71
Search Rate	10.90	5.58	0.00	50.29
Competition Unweighted	4.68	4.40	-24.49	37.76
Competition Weighted	0.41	0.48	-2.39	4.55

Table 2: Estimations of the wage curve

Measure of Job Competition:	(1) Unemployment Rate	(2) Unemployment Rate	(3) Search Rate	(4) Competition Unweighted	(5) Competition Weighted
<i>ln</i> Job Competition	-0.302 (0.197)	-0.079*** (0.013)	-1.007* (0.512)	0.756** (0.293)	1.457*** (0.510)
Group-specific:	No	Yes	Yes	Yes	Yes
On-the-job Search:	No	No	Yes	Yes	Yes
Regional Accessibility:	No	No	No	No	Yes
Adjusted R ²	0.528	0.533	0.475	0.503	0.512
Observations: 198789					

IV; the measure of job competition is instrumented with its one-quarter lag; the standard errors, in parenthesis, correct for correlation within groups; *** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%; other explanatory variables: square of the measure of job competition; age; years of tenure; years of potential experience; gender dummy; a dummy for whether married; a dummy for whether working part-time; industry, occupation, and regional dummies; dummies for qualification level; dummies for year and for quarter of the survey.

Table 3: Estimations of the wage curve by gender

Measure of Job Competition:	(1) Unemployment Rate	(2) Unemployment Rate	(3) Search Rate	(4) Competition Unweighted	(5) Competition Weighted
Men:					
<i>ln</i> Job Competition	-0.156 (0.225)	-0.077*** (0.013)	-1.834* (1.093)	0.808** (0.326)	1.367*** (0.460)
Adjusted R ²	0.491	0.499	0.300	0.458	0.476
Observations: 106705					
Women:					
<i>ln</i> Job Competition	-0.388 (0.292)	-0.086*** (0.014)	-0.488* (0.271)	0.617** (0.265)	1.364** (0.563)
Adjusted R ²	0.487	0.489	0.474	0.469	0.469
Observations: 92084					
Group-specific:	No	Yes	Yes	Yes	Yes
On-the-job Search:	No	No	Yes	Yes	Yes
Regional Accessibility:	No	No	No	No	Yes

IV; the measure of job competition is instrumented with its one-quarter lag; the standard errors, in parenthesis, correct for correlation within groups; *** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%; other explanatory variables: square of the measure of job competition; age; years of tenure; years of potential experience; dummy for whether married; a dummy for whether working part-time; industry, occupation, and regional dummies; dummies for qualification level; dummies for year and for quarter of the survey.

Table 4: Robustness analysis

	(1)	(2)	(3)	(4)
Measure of Job Competition	Men	Women	Men	Women
Unemployment Rate	<i>-0.156</i> (0.225)	<i>-0.388</i> (0.292)	-0.001 (0.065)	<i>-0.072*</i> (0.034)
Skill-specific Unemployment Rate	<i>-0.077***</i> (0.013)	<i>-0.086***</i> (0.014)	<i>-0.025***</i> (0.004)	<i>-0.029***</i> (0.005)
Search Rate	<i>-1.834*</i> (1.093)	<i>-0.488*</i> (0.271)	<i>0.142***</i> (0.030)	<i>0.113***</i> (0.026)
Competition Unweighted	<i>0.808**</i> (0.326)	<i>0.617**</i> (0.265)	<i>0.023**</i> (0.010)	<i>0.015</i> (0.010)
Competition Weighted	<i>1.367***</i> (0.460)	<i>1.364**</i> (0.563)	<i>0.092*</i> (0.047)	<i>0.098*</i> (0.052)
Unemployment / Vacancies	<i>0.003</i> (0.020)	<i>-0.021</i> (0.021)	<i>0.010***</i> (0.003)	<i>-0.001</i> (0.004)
Estimation	IV	IV	OLS	OLS
Observations	106705	92084	124618	107087

*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%; each entry refers to a separate regression. The coefficients in italics are taken from Table 3. IV: the measure of job competition is instrumented with its one-quarter lag; OLS: the lagged – rather than contemporaneous – measure of job competition is used as explanatory variable. The standard errors, in parenthesis, correct for correlation within groups; other explanatory variables: square of the measure of job competition; age; years of tenure; years of potential experience; gender dummy; a dummy for whether married; a dummy for whether working part-time; industry, occupation, and regional dummies; dummies for qualification level; dummies for year and for quarter of the survey.

Table 5: Analysis on Local Authority District data

	(1)	(2)
<i>Men</i>	Regional Unemployment Rate	Unemployment / Vacancies
Measure of Job Competition	<i>-0.214**</i> (0.084)	<i>0.194***</i> (0.034)
Adjusted R ²	0.035	0.115
Observations	401	401
<i>Women</i>		
Measure of Job Competition	<i>-0.357***</i> (0.089)	<i>0.240***</i> (0.034)
Adjusted R ²	0.072	0.150
Observations	388	388

*** Statistically significant at 1%, ** Statistically significant at 5%, * Statistically significant at 10%; other explanatory variable: square of the measure of job competition.

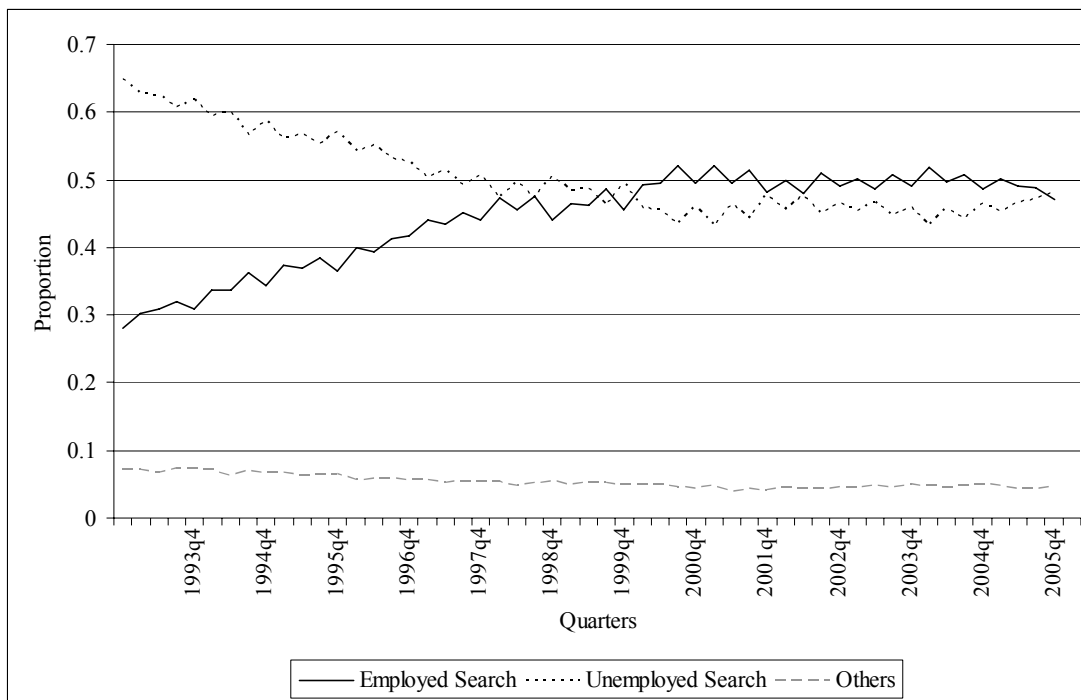


Figure 1: Proportion of on-the-job (Employed) versus unemployed search in Britain

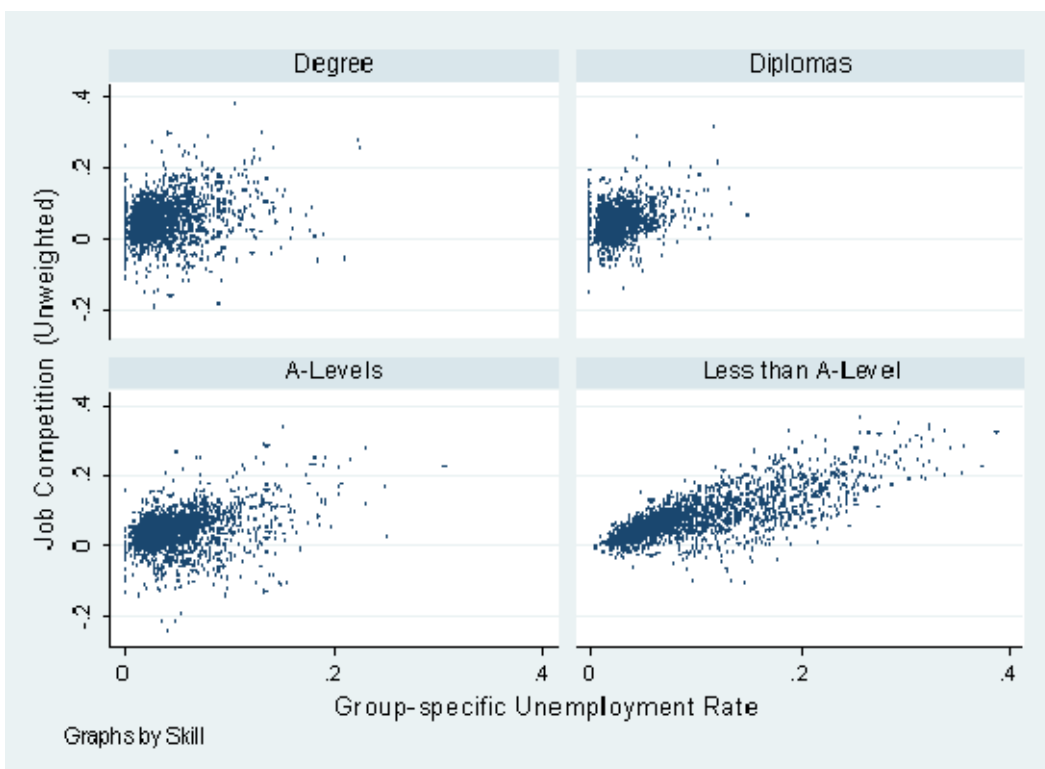


Figure 2: Correlation between the group-specific unemployment rate and the (unweighted) job competition measure by education groups