Abstract

This paper examines the structure of wages in a very specific labour market, for care assistants in residential homes for the elderly on England's "sunshine coast". This sector corresponds closely to economists' notion of what should be a competitive labour market as: (i) there are a large number of small firms undertaking a very homogeneous activity in concentrated geographical areas; and (ii) the workers they employ are not unionized, nor are they covered by any minimum wage legislation so that there are effectively no external constraints on the wage-setting process.

We find that the structure of wages does not, in important respects, resemble what we would expect in a competitive labour market. We find there is a small amount of wage dispersion within firms and a correspondingly large amount between firms. And, the wage dispersion that is present does not seem to be closely related to the productivity related characteristics of workers. We propose a test of the hypothesis that unobserved labour quality can explain our findings and reject it. The paper concludes with a discussion of other possible explanations of the patterns in our data.

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The Structure of Wages
in What Should be a Competitive Labour Market

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1. Introduction

This paper examines the structure of wages in a very specific labour market, for care assistants in residential homes for the elderly on England's "sunshine coast". It analyses the results of a postal survey of all such homes conducted in April 1992 with a follow-up a year later and a few pieces of information added two years after that. Our interest in this sector arises from the fact that it corresponds closely to economists' notion of what should be a competitive labour market. There are a large number of small firms undertaking a very homogeneous activity in a concentrated geographical area. The workers they employ are not unionized, nor were they covered by any minimum wage legislation at this time (the UK's National Minimum Wage was introduced only in April 1999 – see Machin, Manning and Rahman (2000) for an analysis of the impact on this sector) so that there are effectively no external constraints on the wage-setting process. We think it reasonable to argue that most economists, asked *a priori*, would think that this market was very competitive.

If it is competitive, what might we expect to see? We would expect there to be a single market wage for workers of a given quality. This has two important implications. First, workers of identical quality should receive the same wage in different firms. Secondly, workers of different quality should receive different wages even if they work in the same firm. Yet, when we look at our data it is very hard to see something corresponding to this.

We find that there is remarkably little dispersion of wages within firms and a surprisingly large amount between firms. Of all the variables on which we have individual variation, the wage typically has a proportion of dispersion that is inter-firm that is twice as high as any other variable. In fact, something like 1 in 4 workers work in firms where all care assistants get paid the same hourly wage, and another third of workers are in firms where only two different hourly wages are paid. These firms do not have significantly less variation in observable characteristics among their workers than firms that do have wage dispersion.

Of course, a believer in the relevance of the competitive model could (plausibly) argue that our measures of worker quality are far from perfect and that the distribution of unobservable worker quality could be such as to make the data consistent with the competitive model. We present a test of this hypothesis and reject it. The basis of the test is as follows. We show that the correlation between observed characteristics and wages is very different in the firms with and without wage dispersion but the correlation between the prices charged to residents (an indirect measure of worker quality) and

worker characteristics are very similar.

We conclude, from the examination of this data, that the competitive model is not particularly helpful for understanding of the structure of wages in this labour market. But, this prompts the question: what should be put in its place? We review a number of alternative theories of the wage structure, discussing their strengths and weaknesses for the purpose of explaining our data. No one theory emerges as **the** explanation but we do come to a number of general conclusions. First, frictions in this labour market are substantial enough to accommodate considerable and long-lasting heterogeneity in the wage policies of employers without some firms suffering a catastrophic reduction in profits. These frictions can account for the heterogeneity in wages across employers as was emphasized by earlier micro studies of labour markets (*e.g.* Lester, 1946; Slichter, 1950; Reynolds, 1951). Secondly, the lack of wage dispersion within firms is probably driven by two factors: worker dislike of wage heterogeneity on grounds of 'fairness' and employer dislike of wage heterogeneity in order to keep worker demands for wage increases to a minimum. However, these conclusions, while consistent with our data, must remain somewhat tentative. It seems plausible that, for the small employers in this sector, there is an opportunistic aspect to wage policy, with wages being determined on an *ad hoc* basis as events evolve. For example, the threat of a particularly valued worker to leave may cause an employer to break a 'one-wage' policy that is otherwise followed. If this is the case, then outside observers are always likely to have a hard time explaining why a particular structure of wages are observed in particular firms.

2. The Structure of Wages in a Low Wage Labour Market

Data Description

The data set used in this paper was obtained from a survey undertaken by us in April 1992 (plus a follow up a year later) of all (2036 in total) private-sector residential homes for the elderly located on England's "sunshine coast".[1] We were able to sample the entire population of homes by obtaining information on all homes within each county that we considered (Devon, Dorset, Cornwall, Kent, Somerset and Sussex) as they all have to register with the relevant local authority. In Machin, Manning

and Woodland (1993) we documented the representativeness of the responses that we received and, in terms of region and size, they seemed very representative of the entire population.

This sector was chosen because it closely corresponds to economists' *a priori* ideas about a labour market that should be well approximated by the perfectly competitive model. It consists of a large number of small employers doing a relatively homogeneous activity (caring for old people) and which are geographically concentrated (in some streets in some towns on the south coast of England, almost every second house is a residential care home). Furthermore, most workers in these homes need no formal qualifications: the old people in the homes we consider do not need specialist medical care and, as will be seen below, few workers have a formal nursing qualification.

One other unusual feature of this data set is that we have information on all workers within a large number of firms. This allows us to address issues like the extent of wage variation within and between firms that cannot be considered with most data sets. It is this feature of the data that we will exploit most.

The Structure of Wages

The principal occupation of workers employed in these nursing homes is that of Care Assistant and we focus specifically on the wages of Care Assistants in this paper. The reason for doing so is that we are interested in the structure of wages in a very tightly defined labour market and thus we wanted to restrict attention to a single job.

One should note that, even once we restrict attention to Care Assistants alone there is still a choice about whether to include only those labelled as day-care assistants or also those recorded as being senior or junior day-care assistants. This is not trivial as different occupational titles may simply be a way of paying different wages to different individuals and may not signify any real difference in job content (see Baker, Gibbs and Holmstrom, 1994a, 1994b, for a statement of this idea and Manning, 1994, for a working-out in the context of a search model). Most of the results in this paper include those workers labelled as being senior and junior day care assistants, but we also report some results using the more narrow definition of day care assistants only (which tend to strengthen our conclusions).

In Table 1 we report some summary statistics on the distribution of wages in our sample. We have data on 3221 Care Assistants in 434 homes in 1992 and, from the follow up of those who

[1] See Machin, Manning and Woodland (1993) and Woodland (1993) for more details.

responded in 1992 that we conducted a year later, 1826 Care Assistants in 236 homes in 1993. In our matched sample of 213 homes that we obtained responses from in both years we have data on around 1600 Care Assistants in each year.[2]

Average wages are very low in this sector. In 1992 the mean wage was £2.97 per hour and in 1993 was £3.07 per hour. This lies beneath the lowest occupational wage reported in the New Earnings Survey in each of these years and is well below the £3.40 that the Labour Party was advocating as a National Minimum Wage had it been elected in the General Election of April 1992. Despite the fact that we are focusing on a very specific occupational group, there is considerable dispersion in hourly wages among these workers. For example, in both years the range between the tenth and ninetieth percentiles of the hourly wage is over one third of the median wage. We also report information on the standard deviation of the log hourly wage. As the wage distribution for the matched sample is very similar to that for the sample as a whole, we use all the observations in what follows.

Wage Variation Between and Within Companies

An interesting question is how much of the wage variation described above is between employers (different employers paying different average wages to their workforce) or within the same employer (the same employer paying different workers different wages). In Table 2 we present information on the proportion of total variation in the log hourly wage of all care assistants that is inter-firm, the remaining proportion being intra-firm. In the upper panel of the table one can see that for all care assistants almost 2/3 of log wage variation is between firms, with only one-third being within firms. Part of the measured inter-firm wage dispersion is because of the variation of wages across different regions so we also present measures of the importance of inter-firm wage dispersion after introducing geographical controls. The controls for area involve 16 regions that we will use as our regional controls in the regressions below, and the controls for town involve controls for the postal address (this is a very disaggregated measure as there are then 129 towns in our sample). As one would expect, introducing finer regional dummies reduces the measured importance of inter-firm wage dispersion but even with the town dummies, the proportion of inter-firm wage dispersion remains close to 50%. As one might be concerned that the results are driven by the existence of many small firms, we also present the variance

[2] We have not used the data from a handful of single-employee firms as there is obviously no meaningful difference between firms and workers in these cases and it is this difference on which we want to focus.

decomposition for workers who are in homes with more than 5 workers: the results are very similar.

In order to put these figures into some kind of perspective, we also computed the proportion of the observed variance in other personal characteristics that is inter-firm and intra-firm. We have information on age, job tenure, and hours so we use a variance decomposition of the log of all these variables. These results are also reported in Table 2. What is striking is that, whatever geographical controls are used, a much higher proportion of wage variation (typically twice) is inter-firm than for any other variables. So, of all the variables on which we have data, wages have the smallest proportion of total variance within firms. The finding that there is a lot of wage variation between employers in a given labour market is one on which there has been a lot of research (*e.g.* the older papers of Lester, 1946; Reynolds, 1946, 1951; and Slichter, 1950, and the more recent Krueger and Summers, 1988) but, as far as we are aware, this has not been tied to the lack of wage variation within employers[3]. Our result on how there is extraordinarily little wage variation within firms is even stronger when we restrict attention to day care assistants only (the results are presented in the bottom panel of the table).

To reinforce the point that there is surprisingly little wage dispersion within firms we now present some further information on the structure of wages within firms. These results are reported in Table 3. First, about 25% of workers working in about a third of firms have no within-firm variation in wages *i.e.* all Care Assistants receive exactly the same wage. Another third of firms, employing about a third of workers are in firms where there are only two different wages. Only one firm pays all its workers different wages. These wage policies seem very stable. Of the 213 firms in the matched sample, 52 changed from having wage dispersion to not or vice versa (exactly 26 moving in each direction), but of these 29 involved the change in the wage of only a single worker and there are only a handful of cases of large changes in wage structures.

If one restricts attention to larger firms (those with more than 5 workers) one finds that the proportion of both workers and firms with no wage dispersion falls. Looking at these figures on the proportion of firms for which there is no wage dispersion one might be tempted to conclude that there is more wage dispersion in larger firms. But, in some sense, this is the wrong conclusion as there are simply more opportunities for wage dispersion in larger firms. One would like to have some way to normalise the measure of wage dispersion by size of firm.

[3] One should note that this is not likely to be a result that is robust to looking at the dispersion in wages across occupations as the wage gap between managers and care assistants in every firm far exceeds the dispersion in pay in care assistants across firms. So, for example, the findings of Abowd *et al* (1999) who consider all occupations and conclude that individual-specific effects are more important than firm effects is not inconsistent with the findings

One way of trying to normalise the information on wage dispersion is the following. Suppose that all existing workers in the firm are paid the same wage and, conditional on this fact, the probability that an extra worker is paid the same wage is ?. Then, the probability that a firm with N workers will have no wage dispersion is given by $?^{N-1}$. We used the information on the existence of wage dispersion or not to estimate ?[4]. The results are reported in the last row of Table 3 . For all firms the spot estimate of ? is 0.76 so that, given that all existing workers are paid the same wage, the probability that an additional worker will be paid that wage is 76%. Once we restrict attention to firms with more than five workers, the estimate of ? rises to 0.83, a difference that is statistically significant. So, there is a sense in which there is less wage dispersion in large firms.

The notion of wage dispersion that we have considered so far is a very strong one. If a firm pays even one hour of labour at a wage different from the rest of its hours, that firm will be classed as having wage dispersion. We would like to have a measure that is less sensitive to this kind of effect. Table 3 therefore also presents a number of alternative measures of wage dispersion. We report the proportion of total hours worked by care assistants that are paid the modal hourly wage. As one can see, about 75% of hours are paid the modal rate, a proportion that seems extremely high. However, this statistic tells us little about the extent of the variation in wages, so we also present data on the hours weighted standard deviation of log hourly wages.

So far, we have documented that there is surprisingly little wage dispersion within firms, but that there is considerable heterogeneity across firms. Our initial reaction to looking at the data is to think that it is a long way from the 'law of one wage' predicted by competitive labour markets: there seems to be 'too much' wage variation across firms and 'too little' within them. But, we have not presented a formal test of the hypothesis that the observed distribution of wages is the outcome of a competitive labour market *i.e.* one in which all workers are paid their marginal product: this is the subject of the next section.

3. Is the Data Consistent With the Perfectly Competitive Model?

If all workers are paid their marginal product, then the workers in the firms with zero wage dispersion

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reported here.

[4] Note that this is not using all the information about the number of different wages paid in the firm, nor is it allowing

must all have the same marginal product. In some ways this is surprising as there is variation within these firms in observable characteristics that we might expect to be related to worker quality. In our data set the available 'quality' variables are age, sex, tenure and qualifications. Table 4 presents descriptive statistics on these variables at both individual and firm level both for the whole sample and for the sample divided according to whether the firm has any wage dispersion or not. If the competitive model was correct we might expect to see less variation in observable characteristics within firms with no dispersion, but as can be seen from the lower panel of Table 4 there is very little evidence for this.

However, this does not clinch the case against the competitive model as our measures of worker quality are inevitably imperfect and it seems likely that there is an important component of worker quality that is observable to employers but not to us. In general this is an intractable problem but we can hope to make some progress if we are prepared to assume that we have a second measure of worker quality. In the particular market considered here, it is natural to consider that the advantage of higher quality workers is that, other things equal, a higher quality of care can be provided and the price charged to residents can also be higher. So, we propose to use the price as an indirect measure of worker quality[5].

Let us denote the quality of a worker by q and assume that q can be written as:

$$q = b\,x + e \qquad (1)$$

where ßx represents the effect of observable characteristics and e the effect of unobservable characteristics. There is no particular reason to believe that e is uncorrelated with x: in fact, if the competitive model is to be able to explain the lack of wage dispersion in some firms then it cannot be. If the labour market is competitive then w=q where w is the measured wage (one could also allow measurement error in this). When one runs a regression of the wage on the observed characteristics x, one will estimate:

$$E(w|x) = b\,x + E(e|x) = b * x \qquad (1)$$

? to differ with each additional worker.

[5] As we only have price information at firm level, this means that we can only see if the variation in worker characteristics across firms is associated with variation in prices: we cannot examine whether wage dispersion in those firms where it exists rewards the more productive workers.

Table 5 presents estimates of earnings equations both at the individual level and the firm level, for the whole sample and dividing the sample into those firms with wage dispersion and those firms without it. We also include the log of patients per worker hour as a measure of the intensity of worker effort, the log of the number of residents as a measure of the size of the home and a dummy variable for whether the home is part of a larger organisation. For the whole sample, the estimated wage equation is very familiar: wages are a concave function of age, increasing in job tenure, higher for qualified workers and higher in larger firms. There is no premium for male workers but there are very few men in the sample. Large firms and homes with high numbers of patients per worker hour are found to also pay higher wages. When the sample is restricted to firms with wage dispersion, one finds similar results.

But, when one estimates a wage equation for workers in firms without wage dispersion one finds that tenure and qualifications are no longer significant[6], and that age, while significant, has a coefficient that is reduced in size by over 80%. One should think of the return to age in this sub-sample as implying that firms that tend to pay higher wages tend to end up with workers of a particular age. Only the effects of the firm-level variables seem to be the same (or even slightly larger) than before.

Furthermore, these differences between firms with and without wage dispersion are significant: a Chow test for the equality of the coefficients in the two regressions leads to F(25,4407)=11.57 for the individual equations and F(25,543)=2.20 for the firm-level equations, both of which are convincing rejections of the null hypothesis. If the competitive model is correct, these findings imply that the correlation of observed characteristics with unobserved characteristics must be different in the two segments *i.e.* that, if we define a binary variable, DISP, that takes the value 1 if there is wage dispersion and zero if there is not, then $E\left(e \left| x, DISP = 1\right.\right) \neq E\left(e \left| DISP = 0\right.\right)$.

Now let us turn to an analysis of the determinants of the price. Suppose that the relationship between price and worker quality is given by:

$$p = \gamma_0 z + \gamma_1 q + v \tag{2}$$

where z is a vector of observed factors that affect price apart from worker quality (some or all of which

[6] This finding does have implications for the empirical literature on whether the returns to tenure in cross-sectional wage equations are spurious (see *e.g.* Abraham and Farber, 1987; Altonji and Shakotko, 1987; Marshall and Zarkin, 1987; and Topel, 1991). For, in the homes without wage dispersion, we know that any measured returns to tenure must be spurious as, within these homes, high tenure workers do not receive higher wages. As we find no such returns, the return to tenure in the cross-section must be interpreted as being largely the result of some firms paying

may be contained in x) and v is unobserved factors that affect the quality of care. Now, when one runs a regression of p on x and z, one will be estimating:

$$E(p|x,z) = g_0 z + g_1 E(q|x,z) + E(v|x,z) = g_0 z + g_1 b^* x + E(v|x,z) \qquad (3)$$

The basis of the test is that if we estimated price equations across the segments of the market for which we have shown from the wage equation that the correlation of quality with characteristics (*i.e.* ß*) is different, we would also expect to find corresponding differences in the price equations.

The results of this exercise are reported in Table 6. The first column estimates a price equation for the whole sample and the next two columns divide the sample into the firms with wage dispersion and those without. In this sector, the Department of Social Security pays a subsidy for the care of many residents up to a maximum of £175 per week.[7] One consequence of this is that there is a spike in the price distribution at this price and very few homes charging lower prices. Accordingly, we treated (4) as an equation for the desired price and then estimated a tobit model with £175 as the lower censoring point. Looking at the results for the whole sample (column 1), price does seem to be significantly related to the log of patients per worker hour (a measure of quality of care), whether the home is part of a larger organisation, the size of the home and (among the worker characteristics) the average age. This is consistent with a casual reading of job advertisements in this sector, which emphasize that employers prefer older workers.

The second and third columns estimate separate price equations for those firms with and without wage dispersion: what is striking is that the coefficients (on age in particular) are very similar in the two sub-samples. A formal test cannot reject the hypothesis of equality of coefficients with a likelihood ratio test yielding $?^2(25)=19.26$ (the critical value at the 5% level is 38). This is inconsistent with the competitive model which, given the evidence on wages, would predict that there should be significant differences between the two segments. So, we conclude that unobservable worker quality cannot reconcile the observed wage data with the perfectly competitive model, and that the evidence from the price equations suggests that the correlation of unobserved with observed worker quality would seem to

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their high tenure workers higher wages.

[7] The actual system of subsidy is more complicated than this as it involves means-testing, but it is this upper bound on payments that seems to have the most effect on the market.

be very similar in homes with and without wage dispersion.[8]

By comparison of the wage equations in Table 5 and the price equations in Table 6 one can also see that the characteristics of workers that are associated with higher wages are not necessarily associated with higher prices. In particular, job tenure is associated with significantly higher wages but significantly lower prices. This is consistent with empirical findings like those reported in Medoff and Abraham (1980, 1981) and Klein, Spady and Weiss (1991) that the worker characteristics associated with higher wages are not necessarily associated with higher worker quality. One potential way of explaining these results while retaining a competitive view of the labour market would be to appeal to the existence of specific human capital. For then, the wage paid is determined by productivity in the next-best alternative and there is no reason why worker characteristics should not affect worker quality in this firm independent of the wage paid. The main reason why we do not find this explanation of our findings plausible is that the traditional measure used of the extent of firm-specific human capital is job tenure. The Becker (1975) argument is that workers capture some but not all of the returns to specific human capital so that wages rise with job tenure (as shown in the All workers columns of Table 5) but not as fast as productivity. However the estimates in Table 6 shows that this is not the case.

In this section, we have explored further whether the structure of wages we observe is consistent with the competitive model. We have argued that it is not, and that traditional 'get-outs' like unobserved labour quality are implausible explanations of what is observed in the data.

4. Alternative Models of The Structure of Wages

Given the results reported above, we do not think the competitive model is particularly helpful for understanding the particular labour market analysed here. The 'law of one wage' in which there is a given market wage for each quality of worker does not seem to hold. But, is there a more successful alternative? Any theory which successfully explains our data must explain why there is so little wage dispersion within firms, why the wage dispersion that does exist within firms does not seem to be closely related to productivity, and why apparently identical firms seem to have different wage policies that are stable over time.

[8] The one possible case where this will not work is where $E(v_2, x)$ also differs across the segments in a way that exactly off-sets the worker quality effect: this seems a thin straw at which to clutch.

In this section, we consider a number of alternative models of the wage structure that have been proposed, namely rent-sharing models, monopsony models, incentive models, fairness models and implicit contract models. Not all of them are non-competitive (the implicit contract models and some fairness models) in that there may be a single wage for labour of a given type but they all imply some deviation from a competitive spot market. There is considerable overlap among the ideas behind many of these theories so one should not think of them as necessarily mutually exclusive.

Rent-Sharing Models

These models have become popular in recent years as a way to explain the dispersion in wages between firms (see, for example, Christofides and Oswald, 1992). The argument is that there are quasi-rents in all employment relationships and that workers (whether in unions or not) have the ability to extract a share of these rents. As there is likely to be heterogeneity in quasi-rents across firms, the result will be heterogeneity in wages. This could obviously explain the inter-firm wage variability but does not seem persuasive as an explanation of the structure of wages within firms.

The reason is the following. There are no trade unions in any of the firms in our sample so that any bargaining that does occur must be at an individual level. But, given the heterogeneity of individuals we would expect the outcome of this individual bargaining to be considerable wage dispersion within firms that is not in the data. It is simply not credible to think of wages in the firms with no wage dispersion as being negotiated individually with each worker: it seems beyond reasonable doubt that the single wage paid is determined unilaterally by the firm. However, it is quite possible that in some circumstances in some firms, a valued worker gets a raise when they threaten to leave so some of the wages we observe are probably determined by some kind of bargaining.

Incentive Models

There has also been a considerable amount of literature emphasizing how, in the presence of problems of worker moral hazard or shirking, firms may pay wages that diverge from marginal products. Examples of this type of theory are Lazear (1981) and Akerlof and Katz (1989). In this type of model, upward-sloping wage profiles are offered to workers because this provides incentives for workers to put in effort and not to lose their jobs.

A fundamental problem with using this type of model to explain our data is that they have generally been used to explain why there might be more variation in wages within firms than in marginal products, which seems to be the case in, for example, the firms considered by Medoff and Abraham (1980,1981). But, in our data set there is the opposite problem: employers who have workers who we presume to differ in productivity choose to pay all their workers the same wage. These ideas cannot begin to explain this important feature of our data set.

Fairness and Status Theory

One obvious candidate for explaining why there is so little wage dispersion within firms is that workers dislike wage dispersion and believe that all workers doing the same job should be paid the same wage even though some of them may do the job more effectively than others. This type of theory has a long tradition and has recently been suggested by a number of authors (*e.g.* Akerlof and Yellen, 1990, or Frank, 1984) and the usefulness of this type of theory in explaining labour market outcomes has been suggested by Bewley (1999). This type of idea is generally supported by reference to the relevant literature in psychology where it is a commonplace that these considerations are important. It seems plausible that this is an important factor behind the 'single-wage' policy pursued by many employers.

Implicit Contract Theories

Another type of economic theory that might be used to explain the lack of wage dispersion within firms is implicit contract theory (see Rosen, 1986, for a survey). The basic idea is that risk-averse workers are unable to insure against various employment risks in the insurance market and buy insurance from their employers who are generally assumed to be risk-averse. In this case the *ex ante* labour market is competitive but observed wages and employment will not generally be the equilibrium of a spot market. The model was generally used to explain the lack of wage variation over time but could also conceivably be used to explain the lack of variation in wages across workers who are being insured against variation in their productivity (see Harris and Holmstrom, 1982, for a more formal model of this type).

There are a number of reasons why we are sceptical about the relevance of this sort of model to the labour markets we are considering here. First, there is no explicit wage contract guaranteeing

insurance so any insurance contract must be implicit and enforced on the side of the firm by reputation effects. Yet, these are small firms for whom we would not expect reputation effects to be very important. And, average job tenure in this sector is only something like three years so that there is a limited amount of insurance that firms can offer. Secondly, workers should only be able to purchase insurance against variation in productivity that is *ex ante* unobservable. Yet the estimated wage equations of Table 5 suggest that workers in firms with no wage dispersion also manage to obtain insurance against their age, which should not be possible. Thirdly, the fact that owner-managed firms are very common in this sector means that owners are unlikely to be risk-neutral.

Our basic problem with this story is that we do not feel that implicit contract models are the right way to think about the structure of wage policies in this type of labour market where the workers are overwhelmingly part-time and low-paid and jobs short-lived.

Monopsony

There are quite a number of labour market models that have been designed to explain the existence of equilibrium wage dispersion between firms (*e.g.* Albrecht and Axell, 1984; Burdett and Mortensen, 1998; Lang, 1991; Montgomery, 1991). All of these models make some assumption that the labour supply curve facing a firm is not perfectly elastic so that they have some feature of monopsony (see Manning, 2002, for more extensive discussion of monopsony in labour markets). In these models high and low wage firms can coexist in equilibrium because high wage firms have larger workforces in equilibrium or lower turnover costs. This prediction finds support in our data in the sense that there is a robust positive correlation between wages and firm size. But, in all of these models, it is an assumption that all workers within firms are paid the same wage; no convincing explanation for this is offered.

In fact, there are good reasons why we would expect to see the emergence of wage dispersion within firms in this sort of model. The reason is that appropriately chosen wage dispersion can increase profits, essentially because it allows firms to act as a discriminating monopsonist rather than the simple monopsonist assumed in the models.

This might be done through a formal structure e.g. an explicit wage scale relating wages to tenure which will tend to bind workers to the firm (see Ioannides and Pissarides, 1985, for an example of this form of argument). Or it could be done more informally by paying low wages to those with bad outside opportunities, and by raising the wages of workers who receive outside offers. For example, in

the Burdett and Mortensen (1998) model workers are paid wages that are below marginal products and leave when they receive a better wage offer. There are obvious incentives for the firm to pay a higher wage to a worker who has just received an outside wage offer and is about to quit. However, the structure of wages within the firm is determined not just by productivity so this kind of model can explain why the wage dispersion that does exist is often unrelated to productivity.

The problem that remains is to explain why it is that there is so little wage dispersion within firms. One possible line of explanation for this is suggested by thinking about the consequences of a firm adopting a strategy of matching outside wage offers. Workers in a firm that adopts this strategy have an obvious incentive to generate or even invent outside wage offers. It is likely that this means that a firm that responds to outside wage offers will find that their workers have more outside wage offers than does a firm that does not vary wages and hence average wages will be higher. Hence, while wage dispersion offers the possibility of reducing turnover of valued workers, it also will tend to raise average wages. A similar sort of idea is behind Ellingsen and Rosen (1997). In that model firms have a choice of paying a fixed wage to all workers or to negotiating wages with individual workers. The disadvantage of the first strategy is that some workers will not work for the firm (because the wage is too low) even though it would be efficient for them to do so (*i.e.* at a higher wage workers would want the job and they would still be profitable). On the other hand, if wages are negotiated individually, wages are higher on average but all efficient matches are consummated. Ellingsen and Rosen present a model in which both strategies co-exist in equilibrium (*i.e.* offer the same level of profits) a prediction that seems very similar to our data.

5. Conclusions

Most microeconomic data sets do not have sufficient detail to permit a close examination of the structure of wages in a specific labour market. In this paper we have used data on a reasonably large sample of workers and firms in a very particular labour market which, given its structure, we feel most economists would expect to be competitive. But, when one looks at the data it is hard to avoid the conclusion that there are very serious limitations to the usefulness of the competitive model in explaining the data. In particular we feel that the competitive model cannot explain one of the most striking features of our data, the very small amount of wage dispersion there is within firms and the correspondingly large amount

between firms. And, what wage dispersion there is does not seem to be closely related to the characteristics of workers that seem to be associated with high productivity.

We think it is more helpful to think of firms in the labour market as having considerable discretion in the setting of wages, a discretion that has its roots in labour market frictions. They seem to use this discretion to have very simple wage structures, probably because of worker dislike of wage variation among workers doing the same job and reluctance on the part of employers to allow the possibility of individual negotiation of wages. However, these speculations need to be subjected to more formal testing.

Table 1:
Description of the Structure of Hourly Wages for Care Assistants in Residential Nursing Homes, 1992 and 1993

	Cross Sections				Matched Sample of Firms			
	1992		1993		1992		1993	
	All	> 5 workers	All	> 5 workers	All	> 5 workers	All	> 5 workers
All Care Assistants								
Number of individuals	3221	2514	1826	1463	1571	1213	1647	1318
Number of firms	434	246	230	141	213	121	213	124
Average wage	2.96	2.98	3.06	3.07	2.97	2.99	3.07	3.08
Standard deviation of log hourly wages	.16	.16	.16	.16	.16	.16	.16	.16
10th percentile wage	2.45	2.50	2.50	2.50	2.45	2.50	2.50	2.50
25th percentile wage	2.70	2.70	2.75	2.75	2.70	2.70	2.75	2.75
50th percentile wage	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
75th percentile wage	3.20	3.25	3.30	3.30	3.20	3.25	3.30	3.34
90th percentile wage	3.50	3.50	3.60	3.60	3.50	3.55	3.60	3.60
Exclude Junior and Senior Care Assistants								
Number of individuals	2878	2246	1603	1271	1363	1057	1441	1154
Number of firms	434	246	235	141	212	121	210	124
Average Wage	2.97	2.99	3.07	3.09	2.98	2.99	3.07	3.09
Standard deviation of log hourly wages	.15	.15	.15	.15	.15	.16	.15	.15
10th percentile wage	2.50	2.50	2.50	2.55	2.50	2.50	2.50	2.50
25th percentile wage	2.70	2.73	2.77	2.77	2.70	2.70	2.75	2.75
50th percentile wage	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
75th percentile wage	3.20	3.25	3.25	3.30	3.20	3.20	3.25	3.30
90th percentile wage	3.50	3.50	3.60	3.60	3.50	3.55	3.60	3.60

Notes:

1. Wages are hourly rates defined in pounds per hour.

Table 2:
Proportion of Dispersion that is Inter-Firm

All Care Assistants		Year	Log(wage)	Log(age)	Log(tenure)	Log(hours)
All workers	No controls	1992	.64	.23	.29	.34
		1993	.65	.20	.27	.34
	Area controls	1992	.59	.23	.30	.33
		1993	.60	.21	.26	.33
	Town controls	1992	.47	.16	.23	.21
		1993	.48	.15	.18	.20
Workers in firms with more than 5 workers	No controls	1992	.63	.19	.25	.30
		1993	.66	.17	.24	.28
	Area controls	1992	.56	.18	.27	.28
		1993	.60	.17	.22	.26
	Town controls	1992	.37	.10	.17	.14
		1993	.40	.09	.14	.11
Day Care Assistants		Year	Log(wage)	Log(age)	Log(tenure)	Log(hours)
All workers	No controls	1992	.74	.25	.32	.36
		1993	.80	.20	.30	.36
	Area controls	1992	.68	.24	.33	.35
		1993	.76	.21	.29	.35
	Town controls	1992	.57	.18	.26	.24
		1993	.65	.15	.21	.23
Workers in firms with more than 5 workers	No controls	1992	.72	.20	.28	.31
		1993	.80	.16	.27	.29
	Area controls	1992	.65	.19	.30	.30
		1993	.75	.17	.25	.28
	Town controls	1992	.48	.11	.20	.16
		1993	.59	.10	.15	.12

Table 3:
Measures of Intra-Firm Wage Dispersion

	All workers		Workers in firms with more than 5 workers	
	1992	1993	1992	1993
Number of workers	3221	1826	2514	1463
Number of firms	434	236	246	138
Proportion of workers in firms with single wage	.26	.25	.23	.21
Proportion of firms with single wage	.31	.32	.25	.25
Proportion of workers in firms with two wages	.30	.35	.25	.33
Proportion of firms with two wages	.35	.37	.27	.33
Proportion of hours paid the modal hourly wage (PROPMOD)	.76	.76	.74	.73
Proportion of hours paid the modal wage in firms with wage dispersion	.65	.64	.65	.65
Average standard deviation of log hourly wages	.06	.06	.07	.06
Average standard deviation of log hourly wages in firms with wage dispersion	.09	.09	.09	.08
Estimated probability of same wage (standard error)	.76 (.010)	.77 (.012)	.83 (.007)	.84 (.002)

Notes.

1. The final five rows of this table are means across firms. One could of course present the means across individuals but they are very similar so are not reported here.

Table 4:
Descriptive Statistics

	1992			1993		
	All	Firms with no wage dispersion (DISP = 0)	Firms with wage dispersion (DISP > 0)	All	Firms with no wage dispersion (DISP = 0)	Firms with wage dispersion (DISP > 0)
Individual-level						
Number of workers	3221	827	2394	1826	452	1374
Hourly wage	2.96 (.49)	2.97 (.42)	2.96 (.51)	3.06 (.50)	3.05 (.42)	3.07 (.52)
Age	36.5 (14.1)	38.7 (13.3)	35.7 (14.2)	36.9 (14.0)	38.6 (13.2)	36.4 (14.3)
Tenure	2.5 (2.7)	2.5 (2.5)	2.6 (2.7)	2.7 (2.6)	2.6 (2.4)	2.7 (2.7)
Proportion male	.03	.02	.03	.03	.01	.04
Proportion with nursing qualification	.05	.03	.05	.05	.05	.05
DISP	.74	.00	1.00	.75	.00	1.00
PROPMOD	.73	1.00	.64	.74	1.00	.65
Number of workers	10.1 (5.7)	8.4 (4.3)	10.7 (6.1)	10.1 (5.1)	7.8 (3.7)	10.9 (5.2)
Number of residents	17.1 (9.6)	13.8 (6.4)	18.2 (10.2)	17.1 (9.2)	12.8 (5.7)	18.6 (9.6)
Patients per worker hour	.091 (.050)	.075 (.070)	.089 (.042)	.086 (.045)	.089 (.044)	.086 (.046)
Part of larger organisation	.077	.075	.078	.056	.091	.045
Price of bed	195 (29)	194 (33)	195 (28)	208 (34)	204 (34)	209 (33)
Firm-level						
Number of firms	432	135	297	231	74	157
Average hourly wage	2.97 (.39)	2.95 (.40)	2.97 (.39)	3.09 (.42)	3.00 (.39)	3.13 (.43)
Within firm standard deviation of log hourly wages	.026 (.039)	.00	.039 (.042)	.024 (.036)	.00	.036 (.039)
Average age	37.4 (7.8)	39.6 (8.2)	36.4 (7.4)	37.2 (7.3)	38.5 (8.2)	36.6 (6.8)
Within firm standard deviation of age	4.9 (2.8)	5.0 (3.1)	4.8 (2.7)	4.8 (2.8)	4.7 (3.0)	4.8 (2.8)
Average tenure	2.6 (1.6)	2.5 (1.7)	2.6 (1.6)	2.7 (1.5)	2.7 (1.6)	2.8 (1.4)
Within firm standard deviation of tenure	.76 (.79)	.74 (.85)	.77 (.76)	.76 (.68)	.69 (.58)	.79 (.72)
Average proportion male	.03	.03	.03	.03	.02	.03
Average proportion nursing qualification	.06	.04	.06	.07	.06	.07
DISP	.68	.00	1.00	.68	.00	1.00
PROPMOD	.76	1.00	.65	.76	1.00	.64
Number of workers	7.1 (4.4)	6.0 (3.8)	7.6 (4.5)	7.5 (4.3)	6.0 (3.3)	8.2 (4.5)
Number of residents	13.8 (7.3)	11.6 (5.5)	14.7 (7.8)	14.2 (7.9)	11.0 (5.5)	15.7 (8.5)
Patients per worker hour	.111 (.070)	.131 (.097)	.102 (.051)	.103 (.060)	.104 (.053)	.102 (.062)
Part of larger organisation	.049	.045	.050	.047	.067	.038
Price of bed	190 (25)	188 (28)	191 (24)	201 (29)	197 (28)	204 (30)

Notes:

1. Means are presented with standard deviations in parentheses.

Table 5
Estimated Wage Equations

	Dependent Variable: Log Hourly Wage					
	Individual-level			Firm-level		
	All	Firms with no wage dispersion (DISP = 0)	Firms with wage dispersion (DISP > 0)	All	Firms with no wage dispersion (DISP = 0)	Firms with wage dispersion (DISP > 0)
Age/10	.18 (.009)	.030 (.014)	.21 (.010)	.22 (.04)	.06 (.08)	.28 (.05)
Age squared/100	-.021 (.001)	-.003 (.002)	-.024 (.001)	-.026 (.004)	-.006 (.009)	-.033 (.005)
Tenure/10	.10 (.008)	.006 (.014)	.12 (.009)	.12 (.03)	.001 (.006)	.16 (.04)
Male	.006 (.013)	-.010 (.026)	.009 (.014)	-.021 (.051)	-.036 (.085)	-.012 (.063)
Nursing qualification	.062 (.010)	-.034 (.018)	.075 (.011)	.037 (.033)	-.124 (.066)	.056 (.037)
Log residents	.036 (.004)	.068 (.008)	.032 (.005)	.032 (.010)	.052 (.020)	.022 (.011)
Log patients per worker hour	.053 (.009)	-.028 (.007)	.036 (.006)	.019 (.010)	-.020 (.017)	.049 (.012)
Part of larger organisation	.053 (.009)	-.015 (.015)	.070 (.011)	.029 (.023)	.005 (.047)	.038 (.026)
Number of observations	4407	1012	3395	584	171	413
R-squared	.29	.44	.31	.32	.42	.39
Standard error	.14	.10	.14	.11	.11	.11

Notes:

1. Standard errors reported in parentheses. All regressions also include a year dummy and 16 area dummies.
2. The firm-level wage equations are weighted by the number of residents for comparison with the price equations in the next Table.

Table 6
Estimated Price Equations

	Dependent Variable: Log Price		
	Firm-level		
	All	Firms with no wage dispersion (DISP = 0)	Firms with wage dispersion (DISP > 0)
Age/10	.25 (.06)	.28 (.12)	.20 (.07)
Age squared/100	-.031 (.007)	-.038 (.015)	-.024 (.009)
Tenure/10	-.14 (.05)	-.23 (.10)	-.12 (.06)
Male	-.059 (.072)	.032 (.119)	-.13 (.095)
Nursing qualification	-.027 (.049)	-.23 (.11)	.022 (.057)
Log residents	.069 (.014)	.089 (.031)	.066 (.017)
Log patients per worker hour	-.060 (.015)	-.069 (.025)	-.050 (.019)
Part of larger organisation	.096 (.032)	.044 (.064)	.115 (.037)
Number of observations	564	169	395
Log-likelihood	39.4	10.0	39.0
Standard error	.15	.14	.14

Notes:

1. Standard errors are reported in parentheses. All regressions also include a year dummy and 16 area dummies.
2. The price equations have a tobit specification with a lower cut-off at ln(175).

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