PAID HOLIDAY ENTITLEMENTS, WEEKLY WORKING HOURS AND EARNINGS IN THE UK

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ABSTRACT

Paid holiday entitlements are similar on average in the UK to other western European countries, but there is much more variation across jobs in the UK. This paper examines the determinants of paid holiday entitlements for full-time UK workers and the relationship of entitlements to earnings. Holiday entitlements are strongly related to educational qualifications, occupation, job tenure and other employer characteristics. However, these factors cannot explain most of the variation in entitlements, implying there is a wide range of remuneration policies across otherwise similar employers or that some workers manage to obtain higher levels of holiday entitlement than other comparable workers. Longer holiday entitlements are associated with higher earnings, even after controlling for human capital and job characteristics, so that earnings differentials are additional not compensating. By contrast, shorter weekly work hours are associated with lower earnings. Unmeasured skill accumulation or improvements in job match quality appear to be associated with longer holiday entitlements (and higher earnings) but to have little relation to weekly working hours.

NON-TECHNICAL SUMMARY

Full-time workers in the UK enjoy similar holiday entitlements on average to those in other western European countries (about 4-5 weeks per year) but there are much larger differences across jobs in the UK. Just before the introduction in 1998 of the Working Time Regulations (WTR), which imposed a minimum entitlement (initially) of 3 weeks, 27% of full-time workers received more than 5 weeks' holiday, while 12% got 3 weeks or less. This paper examines what can account for the dispersion of holiday entitlements and looks at the relationship of entitlements to earnings. Are holiday entitlements used to supplement earnings in remuneration packages, or do jobs with longer holiday entitlements pay less than jobs with more generous entitlements? And how does the association of earnings and holiday entitlements compare to the relationship between earnings and the other dimension of annual working time, weekly working hours?

Job characteristics like industry, occupation, firm size and job tenure all help to explain holiday entitlements, as do personal characteristics like occupation and education. Long entitlements are associated with high qualifications, long job tenure, managerial and professional occupations, as well as public sector and unionised jobs. But these factors cannot account for most of the differences, which implies there is a wide range of remuneration policies across employers or that some workers manage to obtain higher levels of holiday entitlement than other comparable workers.

Holidays are strongly associated with pay and tend to reinforce differences in earnings rather than compensating for them. Workers with more than 5 weeks' entitlements in 1997 were generally in the top quarter of the full-time earnings distribution, while those with less than three weeks' entitlement were in the bottom third of the distribution. The positive earnings-holidays relationship – or equivalently the negative relationship between earnings and the number of annual weeks worked in the job – remains after controlling for differences in qualifications, occupation, industry etc. After taking account of these factors, a week's extra holiday entitlement – corresponding to 2% fewer weeks worked per year – is associated with approximately 4% higher earnings. This result seemingly contradicts simple economic theory, which predicts that a competitive market should reward shorter entitlements with higher earnings. On the other hand, consistent with theory, the paper finds a positive relationship between earnings and the number of hours worked per week: an increase of 1% in weekly hours is associated with 0.8% higher earnings on average

The contrasting results for weekly working hours and annual working weeks can be explained if there are unmeasured factors like individual skills or differences in job quality which increase both earnings and holiday entitlements, whilst being unrelated to weekly work hours. A possible mechanism is that weekly work hours are relatively fixed by the requirements of the job, whereas holiday entitlements are more flexible. So if firm wishes to attract more, or better, workers by combining higher pay with reduced working time, it could be cheaper to increase holiday entitlements (and earnings) instead of reducing weekly hours. Supplementary analysis in the paper finds that the positive relationship between holidays and earnings cannot be explained by unmeasured factors (such as innate ability) that do not change over time. Instead, the process is more dynamic: as individuals' labour market positions develop – because they accumulate new skills or work their way into better jobs – holidays increase in tandem with earnings. Consistent with this interpretation, those workers whose low entitlements were raised by 'outside forces' (the WTR) do not seem to have experienced a change in earnings.

1. Introduction

The paid holiday entitlements of full-time workers in the UK currently average nearly 5 weeks per year. This figure does not differ markedly from other Western European countries.[1] However, while holiday entitlements in these countries largely reflect legal minima, entitlements in the UK have traditionally been unregulated or very lightly regulated.[2] Only in 1998 did the UK legislate for national minimum entitlements and the initial annual floor of three weeks only affected around 8% of full-time workers.[3] The overall consequence of this light regulatory framework is that, just as there is wide dispersion in weekly work hours, there is much variation in holiday entitlements across jobs in the UK.

This paper analyses the distribution of holiday entitlements in the 'unregulated' labour market of 1997 and documents how entitlements were related to job and personal characteristics. It examines whether, controlling for human capital and job characteristics, there is a relationship between holiday entitlements (or equivalently the number of annual weeks worked in the job) and annual earnings. Are holiday entitlements used to supplement earnings in remuneration packages, or do jobs with longer holiday entitlements pay less than jobs with more generous entitlements? And how does the other dimension of annual working time, the number of hours worked per week, relate to earnings? Comparing the relationship of annual (non-holiday) weeks versus earnings to that of weekly work hours and earnings, the paper discusses the interaction of unmeasured earnings characteristics with annual work weeks and weekly work hours. Finally, the paper examines the earnings effects for those workers whose holiday entitlements were increased by the introduction of the WTR.

The overall aim of the paper is twofold: first, to provide a descriptive analysis of how three aspects of jobs quality – earnings, holiday entitlements and weekly hours – differ across UK workers. Policy is often concerned with aspects of job inequality other than simply

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[1] See the comparative data from the European Industrial Relations Observatory at http://www.eiro.eurofound.eu.int/2005/03/update/tn0503104u.html.

[2] Until 1993 some low-paying industries, in particular retail, hotels and catering, were covered by the Wages Councils, which did regulate holiday entitlements. At their abolition, the Wages Councils covered less than 10% of the workforce.

[3] Proportion of affected full-time workers derived from LFS data used in this paper. The Working Time Regulations (WTR) came into force on 1st October 1998. They initially entitled workers to 3 weeks of annual leave, increasing to 4 weeks a year later (pro-rata for part-timers). The exact amount of leave entitlement in this introductory period, and when exactly coverage began for particular workers, depended on the timing of firms' leave years. The WTR excluded various transport sectors, work at sea, trainee doctors, and parts of the armed forces and police.

earnings (as evidenced by the introduction of the WTR), and it is important to know the extent to which different types of inequality reinforce or cancel each other out. The second purpose of the paper is to compare the descriptive estimates of the association of earnings and working time to what is predicted by the theory of compensating differentials, and to draw some conclusions about how unmeasured characteristics affect holiday entitlements and weekly work hours.

Assuming holidays are valued as a form of leisure, the theory of compensating differentials says that, holding all else constant, longer holiday entitlements (equivalently, fewer annual weeks spent on the job) should result in lower earnings. Similarly longer weekly hours should raise earnings. In practice it is often difficult to detect compensating differentials because simple comparisons across jobs do *not* generally hold unmeasured individual and job characteristics constant. These unobservables – which are often characterised as representing individual variations in productivity but may also reflect labour market frictions – are likely to be correlated with both working time and earnings. By comparing the estimated relationships with theoretical predictions we can better understand how unmeasured characteristics affect outcomes in the labour market.

The cross-sectional regressions show that full-time jobs with longer holiday entitlements (fewer annual weeks) provide higher earnings (seemingly in contradiction to the theory of compensating differentials), while shorter weekly hours are associated with lower earnings (in support of compensating differentials theory). To investigate the role of unobservables in more depth, the paper estimates a fixed effects model on a sub-sample of the data, thereby holding constant time-invariant effects such as innate individual ability. The analysis also exploits the introduction of the Working Time Regulations (WTR) which exogenously raised the bottom the holiday entitlement distribution. The results show that controlling for time-invariant unobservables weakens the cross-sectional relationships somewhat, but cannot overturn the negative annual weeks-earnings association. For those workers whose holidays were increased by the WTR (fewer annual weeks), the negative weeks-earnings relationship was counteracted by a positive effect and overall there was little change in earnings. All in all, there appears to be a dynamic relationship between earnings and holiday entitlements (in the absence of legislation): by gradually increasing their skills or locating better jobs in a frictional labour market, workers manage to obtain (or choose) both higher earnings and longer holidays, all else constant.

A possible explanation for the contrasting effects of work hours and work weeks is that weekly work hours might be quite closely tied to a particular job or production technology, while weeks of work (and thus holidays) are more flexible for the employer. Then the number of work weeks (holidays) will the more adjustable factor in determining the attractiveness of a job: so if an employer wants to offer a good remuneration package, it will be cheaper to combine high pay and long holidays, rather than high pay and a shorter working week. In turn, this means that the number of work weeks (or holiday entitlements) in an earnings equation will be particularly responsive to unobserved differences in individual earning ability or firm remuneration policy.

The paper is organised as follows. The next section reviews the small number of previous studies into paid holidays (or vacations), while Section 3 discusses the theoretical rationale for bunching together leisure in the form of holidays and discusses the expected relationship between earnings and the two dimensions of annual working time, weeks of work per year and hours of work per week. Section 4 documents the wide distribution of holiday entitlements in the UK. It examines how entitlements are correlated with personal and job characteristics, and also compares these relationships to the correlates of weekly work hours. The estimates of the cross-sectional and fixed effect earnings regression are reported in Section 5, which also discusses the results. Section 6 concludes.

2. Related work and the research context

As a general rule, paid holidays (or vacations) have not been very widely studied by economists. Exceptions to this are the work on unionism and holidays by Green and Potepan (1988) and Green (1997), which reported that union membership and workplace recognition were associated with longer holiday entitlements, in both the UK and US. More recently Green (2003) has documented the effect of the WTR on the proportions of workers receiving no holiday entitlement. Altonji and Oldham (2003) compared the effects of holiday legislation across countries, finding that legislation for minimum entitlements reduced annual hours worked; and Altonji and Usui (2005) analysed vacation entitlements and amounts taken in the US. Saborowski et al (2004) examined the amount by which workers in Germany under-use their annual holiday entitlements and Saborowski (2005) investigated the factors behind under-use in Germany and the UK.[4]

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[4] Holiday entitlement presumably only increases well-being if it is actually taken (unless it confers some sort of status on its beneficiary; for example, entitlement sometimes depends on seniority in the firm). Unfortunately,

The paucity of work on holidays is all the more surprising given that, from a labour supply perspective, holidays reduce the total quantity of hours worked. Yet holidays are rarely considered in the labour supply literature. Studies based on the UK mostly measure labour supply as weekly hours worked (see the examples in Tables 1 and 2 of Blundell and MaCurdy's 1999 survey). In the US literature there is a tradition of using annual hours (again see Blundell and MaCurdy, 1999), which should in principle account for different vacation entitlements. But these measures may also confound vacation, sickness absence and spells of (voluntary) unemployment, which are undoubtedly three very different 'goods'.

There is an emerging literature which takes a richer view of time use, considering aspects like the scheduling of activities and coordination between household members and other acquaintances (see inter alia Hamermesh, 1999 and 2002, and Jenkins and Osberg, 2003). In part, these studies are an attempt to overcome the limitations of summative measures of time use, like total hours, and so tend to focus on the detail of daily or weekly schedules. They could be extended to look at annual time schedules, including the timing of holidays and whether they are taken all at once or as several shorter breaks. However, choices over these aspects are logically preceded by the setting of total entitlement and the focus in this paper is this simple summary measure of total available holiday time.

3. Why take holidays? Theoretical considerations

The reduction in working time over the 20th century was achieved mainly by reductions in weekly working hours and partly by reductions in weeks worked through longer holiday entitlements. Between 1954 and 1980, paid holiday entitlements received by production workers in the UK increased from 2 to 4.5 weeks and average weekly hours of manual men declined from 48.4 to 43.1 (figures reported in Elliott, 1991). This corresponds to a total reduction of annual working time of about 380 hours, which can be decomposed into roughly a third due to longer holiday entitlements and two thirds due to short weekly hours.

There are several possible advantages to taking explicit periods of time off work during the year, rather than simply working fewer hours every week. The first, from employers' point of view, is that holidays allow workers to rest and recuperate, so making them more productive when they return to work. There is evidence that the first paid

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the data used here (the LFS) do not contain information on holiday taken. However, the UK Time Use Survey 2000 contains data on both entitlements and the amount taken and indicates that on average workers take most of their entitlement (mean under-use is only 2.6 days, see Saborowski , 2005).

vacations in the US were introduced by employers who saw them as having net benefits for productivity.[5] Second, from workers' point of view, holidays allow activities such as travel that could not be fitted into evenings or weekends, as well as giving the possibility of taking take occasional days off in the week to do odd jobs or fulfil family commitments.

There could also be fixed costs associated with working. For workers, there is the time and cost of getting to work. For employers, there are set up costs at the start of the day or week, like setting up machines, booting up the computer and coordinating with staff about jobs to be done. Fixed costs are an incentive to concentrate working time into a limited number of weeks (or days) and take the remaining weeks (or days) as holidays. An example of this is the stylised annual factory shutdown, combined with intensive use of the machines in the remaining weeks of the year. Fixed costs of working effectively rule out very short weekly (or daily) work hours, however physical constraints will also limit the value of long hours. The combined effect of these technological factors could be to make weekly hours relatively rigid in a given job. The effect will be reinforced if there also advantages to coordinating hours across workers (both within and across firms).

By contrast with this highly non-linear weekly hours-output relationship – first increasing then decreasing returns – there is more likely to be a simple proportionate relationship between net output and the number of weeks worked. The overall effect could be to make weeks a more flexible factor than hours in adjusting the utility offered by a job – so if a firm wished to offer a better remuneration package, it could raise earnings and offer longer holidays, whereas reducing weekly hours would be prohibitively costly. This idea can be illustrated simply as follows: suppose that the value of a worker's product over a year is given by $y = pnf(h)$, where p is the worker's underlying productivity, and n is the number of weeks worked (which is 52 minus the number of weeks of holiday entitlement), and h is weekly work hours. The function $f(h)$ is characterised by increasing returns to hours at low h (so that $f'(h), f''(h) > 0$), and diminishing returns at high h ($f'(h) > 0, f''(h) < 0$). Assume that workers only care about total annual leisure and not how it is distributed across weeks (alternatively, any 'preferences' are assumed to be captured by the costs implicit in $f(h)$), and that they receive the fully value of their output y. Then it is easy to show that optimal hours are given implicitly by $h^* = f(h^*) / f'(h^*)$, the value which maximises the hourly product. The key point in this example is that h^* only depends on technology and not the workers'

[5] See discussions by Green and Potepan (1988) and Altonji and Oldham (2003), based on Allen's (1969) history of paid vacations in the US.

preferences or productivity *p*. By contrast, the optimal number of weeks worked *n** depends on technology, preferences and productivity since it is the value which equates the marginal value of leisure with the marginal return to working time on the extensive margin of weeks. These results are partly an artefact of the model – they depend on the multiplicative relation between output and weeks of work – but they make the point that a non-convexity in the hours-output relationship can effectively produce a 'rigidity' in the choice of weekly hours for a given production technology.[6]

The significance of the relative rigidity of weekly hours is that the empirical relationship between hours (*h*) and earnings (*y*) will tend to be less sensitive to unobserved factors influencing earnings than the relationship between weeks (*n*) and earnings. Consider the following earnings function, based on a log-linearised version of the budget constraint *y = pnf(h)*:

$$log(y_i) = \alpha log(n_i) + \delta log(h_i) + x_i'\beta + \varepsilon_i \qquad (5)$$

where *i* indexes individuals and x_i is a vector of human capital and job characteristics (which determine productivity *p* above). The relationships between the logs of earnings, weekly hours and annual weeks are constrained to be linear for simplicity, but higher order terms are added for more flexibility in the empirical work reported below.[7]

Equation (5) can be viewed as a hedonic earnings function in which *α* and *δ* are the 'prices' or compensating differentials associated with job characteristics *n* and *h*. The error term *ε* is any deviation of earnings from the amount expected given observed human capital characteristics (and working time). It is well established that it is difficult to obtain consistent estimates of prices in hedonic systems because quantities and prices are chosen jointly (Epple, 1987; see also Biddle and Zarkin, 1988, for a specific discussion of hours-earnings equations). In particular in equation (5), *α* and *δ* will be biased if annual weeks and weekly hours are (partially) correlated with *ε*. To take a concrete example, if workers with higher unobserved productivity choose longer holidays (fewer weeks), then the estimate of *α* will be biased downwards.

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[6] There is a related idea in a model by Card (1990) in which firms using non-convex technology (in weekly hours) may react to shocks by laying off workers rather than by reducing weekly hours.
[7] The simple model above would predict a linear earnings-weeks relationship with *α* = 1 and a non-linear earnings-weeks relationship.

An alternative interpretation of (5) is that it describes outcomes in an imperfectly competitive labour market, where ε represents market frictions which cause earnings to deviate from their competitive level. With labour market frictions, utility will not be equalised across jobs. If 'bad' jobs imply both low earnings and short holiday entitlements, then the estimate of α will not reflect the true valuation of holidays that would be revealed in a competitive labour market (see Hwang et al, 1998, and Lang and Majumdar, 2004, for formal models).

As suggested above, there is reason to believe that weekly work hours h are relatively rigid compared to annual weeks n. Then the partial correlation of h and ε will be smaller than the correlation of n and ε, and δ will suffer less bias than α. Section 5 reports the results of earnings regression based on (5) and using a sample of full-time workers in the UK. The estimates, of negative 'returns' to annual weeks but positive 'returns' to weekly hours, are consistent with the arguments above: the 'true' positive relationship between annual work weeks and annual earnings is obscured (and in fact becomes negative) in the data because of unobservable differences in earnings across jobs which affect holiday entitlements. But because weekly work hours are relatively rigid for a given type of job, the estimates reflect more closely the 'true' positive relationship between hours and earnings. Before the main analysis, the next section describes the data used and the distribution of full-time hours and holiday entitlements.

4. Data and descriptive analysis

The data used are taken from the Quarterly Labour Force Survey (LFS). The LFS questions a random sample of 60,000 households in the UK every quarter about their personal, household and labour market characteristics. Households remain in the survey for five quarters ('waves'), allowing them to be compared with themselves up to one year previously. Income questions are asked in the first and fifth waves only, and in a quarterly cross section earnings will typically be available for about two fifths of the sample. The questions asked also depend on the quarter, in particular the question about holiday entitlement is only asked in the 3rd quarter (September – November). The analysis is based on data from the 3rd quarter of 1997, the last year before introduction of the WTR. To maximise the number of usable

observations, I matched in the earnings of individuals currently in waves 2–4 (whose earnings were not therefore available) from the nearest quarter where their earnings were reported.[8]

The basic sample consists of full-time employees – where full-time is defined as total usual weekly hours of 30 or more – who had valid data on all variables used in the analysis.[9] The analysis is restricted to full-timers because part-timers tend to receive less holiday entitlement (typically in proportion to the number of days worked per week), making it difficult to compare them directly to full-timers. Furthermore, the experience of time off work for someone not working a full week is arguably different than for a full-time worker. I dropped observations corresponding to the top 1% of the weekly hours and holiday distributions, and trimmed the top and bottom 1% of observations from the weekly earnings distribution. After these sample selections there were observations on 27,589 workers.

Table 1 shows the sample descriptive statistics. The first line of the table reports that annual holiday entitlement averaged 23.8 days in 1997.[10] Assuming a basic 5-day week in a full-time job, this equates to 4.75 weeks of holiday. The second row shows the corresponding number of weeks actually spent at work (i.e. 52 minus the number of weeks of holiday).[11] The log of this variable is used in the main earnings equations. The first row also suggests a highly dispersed distribution of holiday entitlements – some people had no holiday, while others received as much as 65 days – which is discussed in more detail below. Average full-time weekly hours in the sample were 43.2 and the average hourly wage rate was £7.56.

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[8] For individuals in wave 2, I used the 2nd quarter (their wave 1), for those in wave 3, the 1st quarter (their wave 1) and for those in wave 4, the 4th quarter (their wave 5). Earnings were only matched in if the individual reported being employed in both the 3rd quarter and the other quarter and did not change jobs between the two interviews. The earnings figures were deflated to 3rd quarter prices using the LNMQ seasonally-adjusted average earnings index from the Office of National Statistics. For the calculation of hourly wages, total usual hours were matched in from the same quarters as earnings to ensure that earnings and hours both referred to the same period.
[9] I dropped 11,502 observations from the original 39,582 due to missing data. The main deletions were as follows: in 6,063 cases respondents had not answered the income questions fully. In a further 2,195 cases, when earnings were matched from other waves, the match could not be made because the person had changed jobs or employment status between waves. Information on holidays was missing for 2,219 observations with valid income (7.1% of valid income observations). I also ran the model using the subset of workers in waves 1 and 5 (for whom there was no need to match earnings from other waves) and got very similar results.
[10] The question is: "How many days of paid holiday are you entitled to per year? (Please exclude public holidays.)"
[11] This calculation assumes that paid holiday accounted for all contracted absence from work. A possible source of measurement error is that paid public holidays (which are not statutory) may or may not be incorporated into holiday entitlement. Unfortunately, the LFS does not ask whether public holidays were included in holiday entitlement. Nor does the LFS ask about other forms of special leave which may result in adjustments to earnings; it is assumed that additional leave time is negligible compared to the length of holiday entitlement.

The table also shows that 40% of the sample were women, and that the percentage of workers with children of different ages ranged from 7% (under 2 year olds) to 18% (10-15 year olds). Workers' occupation and SIC92 industry are categorised at one-digit level, and the table also shows that 28% of workers were in the public sector. The LFS data contain information on workplace size, but workplaces with more than 50 employees are coded in the data set as a single category (combining medium-sized and large workplaces). Since this category contains 60% of the sample of full-time workers it is not possible to control very finely for workplace size in the analysis. However, very small workplaces (1-24 employees), containing 28% of the sample, and small workplaces (25-49 employees), covering 13%, can be separated. Finally, the table indicates that a small proportion of workers of workers, 4%, did not have permanent contracts. Since there is a potential problem in defining annual holiday entitlements for jobs with an expected duration of less than a year, these workers are omitted in sensitivity checks reported below.

4.1. Distribution of holiday entitlements

The full distribution of holiday entitlements is graphed in Figure 1. About 3% of the sample reported no paid holiday, and there are prominent spikes at 15, 20, 25 and 30 days, corresponding to 3, 4, 5 and 6 weeks. The modal holiday entitlement was 25 days, received by about 23% of workers. Calculations show that 27% of workers received more than 25 days, meanwhile about 12% got 15 days or less. The bars between the spikes show that substantial numbers of workers were entitled to amounts of holiday that did not form whole numbers of weeks, particularly between 20 and 30 days. Although one is not strictly comparing like with like, it is striking that the shape of the annual holiday distribution is not dissimilar to that of the typical distribution of full-time hours (not shown). Both are highly dispersed, and again this highlights holiday as a source of well-being that varies widely across workers.

This is a small clump of observations in Figure 1 with holiday in excess of 50 days per year. To explore this in more detail, Figures 2 and 3 break the graphs down by 1-digit occupation and SIC92 industry section. The vertical axis of each graph is now scaled in absolute frequency to give an idea of the distribution of workers across occupations and industries. Manufacturing is the single largest industry, followed by wholesale & retail, and health & social work. From the graphs it is clear that very long holiday entitlements are concentrated among professionals in the education sector: these are almost certainly teachers,

whose holidays are a function of how the school year is organised. To avoid this very specific institutional arrangement obscuring the relationships in the rest of the distribution, I exclude education professionals from the remainder of the analysis (although they are included in a sensitivity test).

Figures 2 and 3 also show that simple occupation and industry categories cannot explain the spikes in the data.[12] A regression of holiday entitlement on one-digit occupation and industry dummies (not reported) has an R^2 of 0.12, which rises to 0.16 if 2-digit occupation and industry dummies are used. There is, however, some variation in mean entitlements among different occupations and industries, as shown by the relatively large spike at 30 days for the 'top' three occupations relative to the others. This provides some first evidence that higher paying jobs also offer longer holiday entitlements.

4.2. Correlates of paid holiday entitlement and weekly full-time hours

Table 2 reports the results of a descriptive, reduced-form ordinary least squares (OLS) regression to explain holiday entitlement as a function of personal and job characteristics (using the sample of 26,325 full-time workers excluding teachers). For comparison, the table also includes a descriptive regression of full-time weekly work hours on the same characteristics.[13]

The results confirm that, controlling for industry and occupation, many personal characteristics had an economically and statistically significant association with holiday entitlements. There is an inverted-U shaped age profile, peaking at 35 years, and a positive tenure effect, which is consistent with firm policies that award more holiday entitlement with increasing seniority.[14] Combining the effects of age and tenure, a 20 year-old just beginning a

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[12] The same also applies at a finer level, for example if the graphs are plotted by industry for each occupation separately.

[13] The hours regression is only intended to provide a descriptive picture of how full-time hours are correlated with the various characteristics, and not to measure the (reduced-form) economic relationship between these characteristics and hours. For example, if women who have children tend to move from full-time to part-time work, rather than reduce their full-time hours, the 'descriptive' coefficient associated with children will be an underestimate of the 'economic' coefficient. Estimation of the true relationship would require use of the whole hours distribution, or a model explicitly accounting for the truncation at 30 hours. It would logically be accompanied by a much more complex model of holiday determination for both part- and full-time workers. Since attention is restricted to full-time workers in this paper, the most appropriate descriptive tool for hours is a simple OLS regression limited to the full-time hours distribution. To allow for the heteroscedasticity which is probably introduced by the truncation of the dependent variable, I report heteroscedasticity-corrected standard errors.

[14] Although the quadratic term in tenure is negative and significant, the maximum point of the tenure function is at 28 years, which exceeds the tenure of well over 95% of workers in the sample

job would have acquired an extra 4.6 days of holiday entitlement if they had stayed in the same job for a further 15 years. Most of the increase (3.7 days) is due to the tenure effect.

Holiday entitlements increase with education, e.g. workers with degrees had 2 days more holiday than unqualified workers. As expected from the graphs presented above, occupation and industry affiliation also affected holiday entitlements and the effects could be quite large: e.g. professionals got 3.7 days more holiday than 'other' occupations. Workers in education got 3.4 days more than those in manufacturing, though this estimate may be biased upward if the sample contains teachers who were incorrectly classified into other categories. Controlling for these industry categories, public sector workers received 2 days more holiday than those in the private sector. Larger firms granted about a day more holiday entitlement than firms with fewer than 25 workers. Consistent with the findings of Green and Potepan (1988) and Green (1997), union recognition was associated with longer holiday entitlement (by 1.6 days).[15] The small proportion of workers in non-permanent jobs received much less holiday (–7.5 days) than permanent employees. Finally, there did not appear to be strong regional effects, except that there is some evidence of shorter holidays in Northern Ireland.

Now consider the results for gender, marital status and the presence of children.[16] There was no statistically significant relationship between being a woman and the length of holiday entitlement. However, married women got 0.3 days more holiday than unmarried women, and the presence of children over 5 years also had an effect on women's holiday entitlements – but to *reduce* them by about half a day (the effects for younger children are not significant, however one cannot reject statistically that the effects of the different age groups are the same). These findings contrast with what might be expected given the well-known negative associations between weekly working hours and being female, married and having children. As shown in the right-hand column of Table 2, full-time weekly hours were lower for women (by 2.3 hours) who were married (by a further 0.7 hours) and who had children (by about another hour). A further puzzle is that the effects of gender, marital status and the presence of children on holidays were very similar for men and women (in fact statistical tests cannot reject equality across the genders), and yet their effects on weekly hours were

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[15] Green and Potepan (1988) used the US Panel Study of Income Dynamics, while Green (1997) used the LFS.
[16] The marital status and children variables are interacted with gender, while the other coefficients in the equation are restricted to be equal. To check whether the different family composition effects between men and women may actually be reflecting other differences, I estimated separate equations for men and women. The resulting family composition coefficients were almost identical, and for brevity, Table 2 reports only the pooled regressions.

very different: married men worked about one hour *more* per week, and children did not affect their hours.

The sharp contrast of hours effects across gender, combined with the similarity of holiday effects, and that the fact that children affected holidays in the unexpected direction (i.e. children actually *increased* the number of weeks worked) suggest that, in the holiday equation, the family structure variables are picking up more than preferences. Even if one argued that there is evidence of women with children substituting shorter holidays for fewer weekly hours, this does not explain why men with children also had shorter holidays, but without a compensating shorter working week. While typical labour supply characteristics – at least for women – had the expected effects on weekly hours, their association with holidays seems a good deal more complex. An implication of this is that household characteristics may not be good instruments for annual work weeks in an earnings equations (and, as mentioned below, tests using these instruments were not successful).

5. Association of weekly hours and annual weeks with earnings

Table 3 presents some direct evidence about how earnings are related to holiday entitlements and weekly hours in the raw data. Annual earnings are derived from the LFS variable GRSSWK, which is gross pay in the main job from the last pay period, converted to a weekly equivalent.[17] Longer hours are clearly associated with higher earnings: those working between 30 and 34 hours per week earned £9624 on average, compared to over £22500 for individuals working 60 or more hours per week. We find almost the exact opposite relationship for the number of annual weeks worked: shorter holiday entitlements are associated with *lower* earnings. Workers with between 1 and 2 weeks' holiday earned only £10323 on average, while those with more than 30 days' holiday earned nearly £22000. These figures correspond roughly to the top and bottom quartiles of the earnings distribution so that earnings differences tend to reinforce differences in holiday entitlement, not compensate for them. However, the relationship reverses for very short entitlements: those with under a week's holiday earned slightly more (£12048) than those with just over a week. The data show that 95% of this group reported having no holiday entitlement at all, so this

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[17] I assume that annual pay is 52 times weekly equivalent pay. This would be incorrect if the last amount of pay were not the usual amount, or there were bonuses, say, included in other pay periods. The amount of bias in the first case can be assessed by restricting analysis to observations where the reported pay was the usual amount. Unfortunately, there is no information (in the 1997 LFS) on whether GRSSWK is the usual amount of pay, but there is information on whether the net pay reported is the usual amount. As a sensitivity check, Section 5.2 reports econometric estimates based on samples in which reported net pay was the usual amount.

perhaps indicates that there are compensating differentials for those who agree to sacrifice holiday entitlements completely. Of course, these relationships may be confounding other factors, so the next section presents the multivariate analysis.

5.1 Cross-sectional earnings regressions

Table 4 reports estimates of hedonic earnings functions based on equation (5). The dependent variable is the log of annual earnings, and the working time variables are entered as quadratics in the log of weekly work hours and the log of annual work weeks (as a sensitivity check, section 5.2 presents a specification in which holiday entitlement enters directly). The other controls are human capital, demographic and job characteristics, including industry and region, and the sample contains all available full-time workers excluding teachers. The table shows results for the full sample as well as separate estimates for men and women in the public and private sectors (pooling tests rejected equality of coefficients across these groups).

The coefficients associated with the log hours variables show that there were diminishing returns to full-time hours worked (the returns were positive up to around 60 hours per week; a cubic term was not statistically significant). The elasticity of earnings with respect to hours, evaluated at the mean of 43.2 hours per week, was between about 0.6 and 0.8, depending on the subgroup. The lowest mean return was among women in the public sector, where an increase of 1% in weekly hours produced a 0.58% increase in annual pay. These results support the idea that production rises with weekly hours worked but gradually levels off due to worker fatigue. The estimated relationship probably averages out a good deal of heterogeneity, however. For example, some workers receive overtime premia that are greater than the straight-time hourly rate – giving increasing returns over a range of hours – but this will be counterbalanced by other workers who are not paid at all for overtime.

Now consider the coefficients associated with annual weeks worked. If there were constant (positive) returns to annual weeks, the coefficient on the log of annual work weeks would equal one and that on the squared term would be zero. For all the subgroups except private sector men, the coefficient on the log of weeks is positive, and that on the square of the log of weeks is negative. The maximum point of these functions is at just over 40 weeks per year (the highest is 43.4 weeks for public sector women), and the returns were *negative* for over 99% of each sub-sample (for over 95% of public sector women). For private sector men, the log hours coefficient is negative while the squared log hours coefficient is positive, but again the overall effect is negative (and for the whole sample).

Because it is not easy to see the shape of the weeks-earnings relationship from the raw coefficients, Figure 4 plots graphs of log earnings against weeks worked for all the sub-samples and the pooled sample, where the log of earnings is normalised to zero at about the mean of annual weeks (47.5 weeks). The graphs all have similar shapes, with marginal effects of similar magnitudes; the main difference is for private sector men, where, in contrast to the effects in the other subgroups, the returns become even more negative with increasing weeks of work. But note that in the neighbourhood of the average number of annual weeks worked, all the graphs are very similar.

Table 4 reports the marginal effects evaluated at the mean of annual weeks. The estimates are clustered quite close together, confirming the evidence from the graphs, and range from –1.9% (public sector women) to –2.5% (private sector women). So an increase of 1% in the number of annual weeks worked was associated with a reduction of around 2% in annual earnings. This result is qualitatively similar to the finding of Altonji and Usui (2005) for the US, who found that more paid vacation was associated with a higher hourly wage.

5.2. Sensitivity checks

The estimated returns to weekly working hours are positive, as expected from the theory of compensating differentials, but the returns to annual working weeks (holiday entitlements) are negative (positive), contrary to theory. To check that these anomalous results are not being driven by peculiarities of the data used, or the specification estimated, this section briefly presents some robustness tests using restricted (or expanded) samples, and different specifications of the earnings function. The next section then investigates the role of unobserved characteristics.

Table 5 reports the marginal effects of weekly work hours and annual work weeks based on these new estimates. The top panel of the table excludes the nearly 30% of observation in the sample which were provided by proxy respondents (usually the spouse or partner of the target respondent), restricting estimation to those who reported their own earnings. The next panel excludes workers not on permanent contracts (4% of the sample), since it may not make sense to talk about an annual earnings-holiday package for these employees. The third panel looks at whether there could be bias because some reported earnings for the previous period are not the usual amounts, leading to error in calculated annual earnings. In the 1997 LFS, there is no indicator of whether the gross pay amounts are usual, but there is information about whether the corresponding amounts of net pay are the

usual amounts. The sample in this panel is limited to individuals whose net pay was the usual amount (78% of the full sample). The fourth panel adds teachers to the sample, who previously were excluded so that the results were not influenced by the specific institutional arrangements in education. An argument for *not* excluding them is that holiday entitlements (and the trade-off with earnings) may be a factor in the choice to take up teaching. In fact, as Table 5 shows, there is very little difference between the results from this or any of the three other samples above and the original sample in Table 4.

The final two panels focus on changes to the earnings specification. First, it may be that occupational choice is the mechanism by which wages (and holiday entitlements) are 'realised', rather then being an exogenous explanatory factor. The fifth panel shows that omitting occupation slightly increases the magnitude of the coefficients, reinforcing previous results. Finally, as an alternative to the full hedonic earnings framework, the bottom panel of Table 5 shows the marginal effect of holiday entitlement in a equation with the log hourly wage on the left-hand side, without controls for weekly hours and with weeks of holiday entitlement (rather than annual work weeks) entered directly. The coefficient (in the pooled sample) of 0.044 shows that a week's extra entitlement is associated with a 4.5% higher hourly wage. This corresponds approximately to the 2% earnings elasticity (holding weekly hours constant) estimated above.

5.3. Unobservable characteristics and the endogeneity of weekly work hours and annual work weeks

The earnings functions estimated can be seen as hedonic relationships, where the quantity and price of the characteristics in question (weekly hours and annual weeks) are chosen simultaneously. So there are highly likely to be unobserved factors which are associated with both earnings and working time, and this in turn means that the descriptive estimates presented above probably diverge from the true market valuations of work weeks and hours predicted by theory. Before drawing conclusions about the role of unobserved characteristics, I present two sets of estimates which should be less susceptible to the effect of unobservables.

The first set of estimates are from a fixed-effect (FE) version of the earnings regression:

$$log(y_{it}) = \alpha_1 log(n_{it}) + \alpha_2 log(n_{it})^2 + \delta_1 log(h_{it}) + \delta_2 log(h_{it})^2 + x_{it}'\beta + u_i + \varepsilon_{it} \qquad (6)$$

where the subscript t indexes the year (1997 or 1998) and u_i is a time-invariant, unobserved individual effect. By explicitly controlling for u_i, the FE model accounts for the influence of time-invariant unobservables like innate ability (although it does not hold constant the transitory error term ε_{it}).[18] If the cross-sectional estimates were being driven by a strong association between these time-invariant unobservables and working time, then the FE estimates should differ from the OLS estimates.

Because of the structure of the LFS, the FE model can only be estimated using a subset of the cross-sectional sample, those who were in their first wave in the third quarter of 1997 and were therefore still in the panel a year later (the third quarter of 1998). The new data set then potentially has two observations on each worker, with earnings, hours, holidays and all the other variables measured at both points.[19] A further restriction (which is exploited in the second set of estimates below) is that the WTR were introduced on 1st October 1998. I therefore limited the sample to workers interviewed before this date (about a third of the sample). A caveat here is that there may have been anticipation effects, especially if the WTR were incorporated into firms' annual leave years beginning before the introduction date. However, if the WTR were implemented as legally intended, i.e. holidays increased to the 3 week minimum without any reduction in earnings, this would actually have weakened the negative association between annual weeks and earnings (again, the WTR effect is exploited in more detail below).

After selecting individuals who met the sample criteria in both waves, I was left with a sample of 1,117 workers. Because of the relatively small sample size, I did not stratify it by gender and sector.[20] Table 6 reports the estimates, which omit region controls (and female gender) but include a dummy indicating whether the worker changed jobs between the two periods and a dummy variable for 1998. It is important to control for job changes, since both holidays (as well as hours) and earnings will tend to change more when the job changes.

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[18] An alternative strategy would be to instrument the four hours and weeks variables in the earnings equation. An obvious choice of instruments would be variables relating to the presence of children. But the reduced-form holiday equation in Table 2 suggested that children were not a very good predictor of annual weeks worked. I did experiment with two-stage least squares estimation. Not only were the children variables weak predictors of annual weeks, but a test of overidentifying restrictions strongly rejected that the instruments were exogenous in the earnings equation.

[19] I could not take workers in their fifth wave in 1997 and match in data from the previous year, because in 1996 earnings data were only collected in the fifth wave.

[20] A test of pooling just failed to reject equality of coefficients at the 5% level. It is not necessarily surprising that pooling is rejected in a cross-sectional model but not in a FE model, since much heterogeneity will be picked up by the individual-specific intercepts.

Table 6 shows that, although the magnitudes of the effects are smaller than in the cross-sectional analysis, the estimated earnings elasticity of weekly hours is still positive (at mean hours), and the estimated earnings elasticity of annual weeks is still negative (at mean weeks). The individual hours coefficients are not individually significant at conventional levels, but they are jointly significant at better than the 0.01% level (the quadratic form was retained for comparison with the cross-sectional results). The weeks coefficients are both individually significant. The hours elasticity is 0.44, compared to 0.79 in Table 4, and the weeks elasticity is –1.24, compared to –2.16 in Table 4. A Hausman-type test of the FE specification against the OLS cross-sectional specification (which is relatively efficient if individual effects are not important) rejected OLS; however, the standard errors associated with the individual coefficients suggest that the differences in the weeks and hours elasticities are not significant. Overall, part of the association of earnings with hours and weeks can possibly be explained by time-invariant unobserved characteristics, but this is certainly not enough to remove the negative sign associated with annual weeks.

The second set of estimates is derived from the full panel sample which includes those observed (for a second time) after 1st October 1998. Again, a FE model is estimated, but including interactions with a dummy variable to indicate workers who should have had their holiday entitlements increased by the WTR – this sub-group consists of those observed after 1st October 1998 and who were entitled to less than 3 weeks holiday in the previous year. The WTR dummy was interacted with the two annual weeks variables, the two weekly hours variables (for comparison with annual weeks effects), and the 1998 dummy variable (to detect any separate effect on earnings due to the WTR). The mean increase in holiday entitlements for those affected by the WTR was 10.9 days, compared to 0.4 days overall. The results (in Table 7) show that for workers unaffected by the WTR, the hours elasticity is close to the previous FE estimates (0.39 compared to 0.44), while the elasticity of earnings with respect to annual weeks is somewhat smaller (–0.70 compared to –1.24) but still negative and significant. The interaction terms show that (as would be expected) there was no additional effect (elasticity = 0.02) on earnings due to changes in weekly hours for those whose holidays were increased by the WTR.[21] However, there is a large, *positive* additional effect (of 0.88) due to changes in the annual weeks of those affected by the WTR (the two

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[21] A separate question, not addressed in this paper, asks about the effect of the WTR on weekly work hours and any knock-on effects on earnings. The WTR limited weekly hours to 48, but since workers were allowed to opt out of this provision it is not straightforward to analyse. Weekly hours do not seem to have fallen in this sample following the WTR.

annual week coefficients are jointly significant). The positive additional effects actually overrides the negative association in the unaffected sub-sample, so the total effect (the sum of the main effect and interaction term) of annual work weeks on earnings is slightly positive, at 0.18.

Overall the FE results suggest strongly that the negative association of annual weeks and earnings is driven by unobservable factors and that time-varying unobservables play an important role. In a further FE specification (not reported) containing only linear terms in log weeks and log hours, I instrumented log weeks using the WTR indicator and came to the same conclusion: the log weeks coefficient was -0.37 ($t = 2.1$) in the uninstrumented FE equation compared to 0.14 ($t = 0.3$) in the instrumented equation.

5.3. Discussion

Descriptive regressions show that longer weekly work hours are associated with higher earnings, while more weeks of work per year in a job (shorter holiday entitlements) are associated with *lower* earnings. So 'good' jobs offer both higher earnings and more holidays, but may involve longer weekly hours. There is some evidence from fixed-effects models that these relationships partly reflect unobserved factors associated both with working time and earnings. But taking account of the time-invariant component of these factors cannot overturn the negative weeks-earnings relationship, which appears to be driven by time-varying factors.

What are these unmeasured factors and why do they seemingly affect the weeks-earnings association more than the hours-earnings relationship? Unobserved effects are often assumed to represent innate individual ability. If workers with higher earnings ability choose to 'spend' some of it on longer holidays, then this could produce a negative correlation between annual weeks and earnings. But there are also other sources of unobserved effects. A burgeoning empirical literature is based on estimating unobserved firm effects, the unmeasured counterparts of the job and firm characteristics included in regression models (see Abowd and Kramarz, 1999, for an introduction). In this scenario a large unobserved effect could correspond to a high paying firm that also has a policy of offering generous holiday entitlements. More generally, unobserved effects will arise in frictional labour markets because earnings depend on search costs and employers' market power as well as productivity. In this case, utility will not be equalised across jobs, and jobs with lower earnings (conditional on productivity) may also have shorter holiday entitlements. Hwang et al (1998) (and using a different model, Lang and Majumdar, 2004) showed formally that in a

labour market with search frictions, the equilibrium relationship between wages and job amenities will not reveal workers' valuation of the amenities.

To the extent that innate individual ability does not change over time, the estimates suggest that ability cannot explain the estimated weeks-earnings correlation, and neither can firms' holiday policies (assuming they do not change) for those workers who do not change jobs (note that job tenure controls account for seniority-induced increases in holiday). Instead, there seem to be more dynamic factors at work: as individuals' labour market positions develop their holidays increase in tandem with their earnings. One mechanism is that in a frictional labour market, employees gradually work their way into better firms which not only pay more but offer more generous holiday entitlements. Another possibility is workers acquire new (unobserved) skills and choose to take some of their extra earning power in the form of longer holidays.

To the extent that the relationship between weekly hours and earnings was reasonably in line with theoretical expectations, while the annual weeks-earnings association strongly contradicted theory, we can conclude that weekly hours are much less sensitive to unobserved factors such as labour market frictions and the evolution of individual skills. A possible reason for this is that weekly hours are relatively rigidly tied to a given production technology, making holiday entitlements a much more adjustable factor in the utility offered by a job. If a firm wished to improve its overall remuneration package by increasing pay and also offering shorter working time, it might be much cheaper to offer longer holiday entitlement than a reduction in weekly hours.

6. Conclusions

Full-time workers in the UK enjoy similar holiday entitlements on average to those in other western European countries (about 4-5 weeks per year), but entitlements vary much more across jobs in the UK than in these other countries. In 1997, 27% of full-time workers received more than 5 weeks holiday, while 12% got 3 weeks or less. Job characteristics like industry, occupation, firm size and job tenure can explain some of this variation, as can personal characteristics like occupation and education. But many differences in holiday entitlements across jobs remain unexplained, implying there is a wide range of remuneration policies across otherwise similar employers or that some workers manage to obtain longer entitlements than other comparable workers. Controlling for a large set of human capital and job characteristics, shorter holiday entitlements (more annual work weeks) were associated

with higher earnings, so inequalities in holiday entitlements tend to reinforce inequalities in earnings.

Unlike the finding for annual work weeks, differences in weekly work hours *were* compensated by earnings differentials: more weekly hours attracted higher earnings. Both weeks and hours effects remained after controlling for time-invariant unobserved characteristics. A likely explanation is that unobserved (and time-varying) factors like individual skills acquisition and labour market frictions affect holidays much more than weekly work hours. It has been suggested that this is because holidays are a more flexible element in remuneration packages than weekly hours, which are probably tied strongly to particular jobs.

Table 1
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Holiday entitlement (days)	23.77	9.51	0	65
Annual weeks of work	47.25	1.90	39.00	52.00
Total usual weekly hours	43.15	7.65	30.00	72.00
Gross weekly pay in main job (£)	327.21	168.78	15.33	1058.00
Hourly wage rate	7.56	3.62	0.31	33.06
Age (years)	38.95	11.28	16.00	76.00
Tenure (years)	8.83	8.35	0.00	49.00
Dummy variables for:				
Female	0.40		0	1
Married or cohabiting	0.72		0	1
Dependent children in family under 2	0.07		0	1
Dependent children in family aged 2-4	0.10		0	1
Dependent children in family aged 5-9	0.14		0	1
Dependent children in family aged 10-15	0.18		0	1
Dummy variables for highest qualification:				
Degree	0.17		0	1
Other higher education	0.11		0	1
A-level	0.27		0	1
O-level	0.21		0	1
Other qualifications	0.14		0	1
No qualifications	0.10		0	1
Dummy variables for one-digit occupations:				
1. Managers	0.18		0	1
2. Professionals	0.11		0	1
3. Assoc professionals	0.11		0	1
4. Clerical	0.17		0	1
5. Craft	0.12		0	1
6. Personal & protective	0.08		0	1
7. Sales	0.05		0	1
8. Machine operatives	0.12		0	1
9. Other occupations	0.05		0	1
Dummy variables for SIC92 sections:				
A. Agriculture	0.01		0	1
B. Fishing	0.00		0	1
C. Mining	0.00		0	1
D. Manufacturing	0.25		0	1
E. Elect, gas, water	0.01		0	1
F. Construction	0.06		0	1
G. Wholesale & retail	0.12		0	1
H. Hotels & restaurants	0.02		0	1
I. Transport & comms	0.07		0	1
J. Finance	0.05		0	1
K. Property	0.09		0	1
L. Public administration	0.09		0	1
M. Education	0.07		0	1
N. Health & social work	0.11		0	1
O. Other community	0.04		0	1

(Continued over)

Table 1 continued

Variable	Mean	Std. Dev.	Min	Max
P. Private households	0.00		0	1
Q. Extra territorial orgs	0.00		0	1
Dummy variables for workplace size:				
1–24 employees	0.28		0	1
25–49 employees	0.13		0	1
Over 50 employees	0.60		0	1
Dummy variables for:				
Employed in the public sector	0.28		0	1
Recognised union at workplace	0.50		0	1
Non-permanent job	0.04		0	1

Notes: Number of observations is 27,589.

Table 2
The correlates of holiday entitlement and weekly hours – OLS regressions

	Holiday entitlement (days)		Total usual weekly full-time hours	
	Coefficient	*t*-ratio	Coefficient	*t*-ratio
Age (years)	0.279***	11.16	0.322***	11.67
Age squared	-0.004***	11.45	-0.004***	12.52
Tenure (years)	0.338***	24.21	-0.027*	1.70
Tenure squared	-0.006***	14.19	0.000	0.21
Degree	2.044***	11.40	1.331***	6.54
Other higher education	1.265***	6.99	0.863***	4.26
A-level	1.189***	8.28	0.882***	5.48
O-level	1.064***	7.18	0.584***	3.55
Other qualifications	0.622***	4.07	0.980***	5.67
Female	0.212	1.41	-2.281***	14.30
Male * married	0.487***	3.82	1.115***	7.52
Female * married	0.270**	2.03	-0.754***	5.97
Male * children under 2	-0.333*	1.82	-0.140	0.64
Male * children aged 2-4	0.034	0.21	0.048	0.25
Male * children aged 5-9	-0.481***	3.45	0.260	1.52
Male * children aged 10-15	-0.393***	3.04	0.139	0.88
Female * children under 2	-0.267	0.90	-1.060***	4.04
Female * children aged 2-4	-0.211	0.80	-0.799***	3.46
Female * children aged 5-9	-0.642***	3.09	-1.118***	5.52
Female * children aged 10-15	-0.449***	2.61	-1.476***	8.80
Manager	2.882***	14.21	2.667***	11.15
Professional	3.669***	15.15	0.729**	2.55
Assoc professional	2.704***	12.34	-0.400	1.61
Clerical	1.730***	8.49	-1.499***	6.61
Craft	1.327***	6.37	0.662***	2.78
Personal & protective	0.974***	4.37	0.550**	2.09
Sales	1.491***	5.89	-0.537*	1.85
Machine operative	1.180***	5.71	1.840***	7.49
Agriculture	-2.414***	5.98	2.451***	4.24
Fishing	-2.115	0.99	2.395	0.73
Mining	-1.412***	2.61	3.411***	4.98
Elect, gas, water	1.329***	3.59	-0.972**	2.51
Construction	-1.637***	9.19	0.952***	4.59
Wholesale & retail	-0.741***	5.20	0.128	0.81
Hotels & restaurants	-1.626***	6.00	0.387	1.01
Transport & comms	-0.310*	1.94	2.106***	10.70
Finance	0.487***	2.61	-0.694***	3.61
Property	-0.975***	6.29	-0.487***	2.83
Public administration	0.371*	1.79	-0.260	1.20
Education	3.399***	12.16	-1.328***	4.76
Health & social work	-0.730***	3.86	-0.241	1.14
Other community	-0.597***	2.82	0.385	1.55
Private households	-0.784	0.85	1.640	1.28
Extra territorial orgs	2.411	1.48	0.286	0.13
Public sector	2.071***	13.87	-1.364***	8.22
Firm size 25–49 employees	1.001***	7.75	0.119	0.82
Firm size 50+ employees	1.332***	13.90	0.262**	2.41
Recognised union	1.621***	16.88	-1.011***	9.22

(Continued over)

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Table 2 continued

	Holiday entitlement (days)		Total usual weekly full-time hours	
	Coefficient	*t*-ratio	Coefficient	*t*-ratio
Non-permanent job	-7.501***	37.90	-0.864***	3.54
Tyne & Wear	0.582*	1.86	-0.586*	1.67
Rest of northern region	0.298	1.24	-0.698***	2.65
South Yorkshire	-0.262	0.89	-0.422	1.30
West Yorkshire	-0.221	0.90	-0.328	1.18
Rest of Yorks & Humberside	-0.224	0.83	-0.267	0.88
East Anglia	0.232	0.99	0.143	0.54
Inner London	0.172	0.67	-0.133	0.45
Outer London	0.280	1.39	-0.355	1.56
Rest of South East	0.153	0.93	-0.064	0.35
South West	-0.262	1.35	-0.528**	2.49
West Midlands (met county)	0.040	0.18	-0.317	1.26
Rest of West Midlands	0.019	0.09	-0.186	0.76
Greater Manchester	0.462*	1.94	-0.449*	1.70
Merseyside	0.041	0.14	-1.107***	3.53
Rest of North West	0.007	0.03	-0.452*	1.81
Wales	0.022	0.10	-0.238	0.96
Strathclyde	-0.242	1.04	-0.317	1.24
Rest of Scotland	0.491**	2.30	-0.601**	2.55
Northern Ireland	-1.007***	3.84	-1.204***	4.41
Constant	10.578***	20.44	38.000***	67.01
Observations	26325		26325	
R-squared	0.28		0.21	

Notes: (i) The sample comprises full-time workers (total usual hours in main job of at least 30 hours per week) excluding teachers; (ii) For the multiple categories, the base cases are no qualifications (education), other occupations (occupation), manufacturing (industry), firm size 1-24 employees, and East Midlands (region); (iii) the *t*-ratios for the hours regression are derived from heteroscedasticity-consistent standard errors; (iv) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3
Earnings, weekly work hours and holiday entitlements

Annual paid holiday entitlement (days)	Mean annual earnings (£)	Total usual weekly hours including overtime	Mean annual earnings (£)
0-4 days	12048	30-34 hours	9624
5-9 days	10323	35-39 hours	14037
10-14 days	10713	40-44 hours	16586
15-19 days	12551	45-49 hours	19221
20-24 days	15317	50-54 hours	21078
25-30 days	18694	55-60 hours	21260
30+ days	21822	60+hours	22529

Notes: (i) Annual earnings are estimated as 52 * gross weekly earnings; (ii) $N = 26325$, sample excludes teachers.

Table 4
Earnings, weekly work hours and annual work weeks – cross-sectional estimates

	All	Private sector		Public sector	
		Men	Women	Men	Women
log (weekly hours)	5.645***	2.547***	8.139***	7.663***	8.123***
	(12.92)	(3.45)	(8.87)	(5.39)	(6.98)
log (weekly hours) squared	-0.645***	-0.247**	-0.976***	-0.917***	-1.003***
	(11.24)	(2.57)	(7.96)	(4.93)	(6.38)
Marginal effect of work hours at mean hours	*0.79*	*0.69*	*0.80*	*0.76*	*0.58*
log (annual weeks)	46.210***	-43.075***	70.591***	54.735**	84.157***
	(6.70)	(2.85)	(4.22)	(2.34)	(6.87)
log (annual weeks) squared	-6.265***	5.276***	-9.467***	-7.394**	-11.147***
	(7.01)	(2.70)	(4.38)	(2.43)	(6.95)
Marginal effect of work weeks at mean weeks	*-2.16*	*-2.34*	*-2.50*	*-2.35*	*-1.90*
Age	0.052***	0.061***	0.048***	0.037***	0.034***
	(36.65)	(29.57)	(17.92)	(8.07)	(8.44)
Age squared	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***
	(34.97)	(28.12)	(16.90)	(7.77)	(8.52)
Tenure	0.011***	0.009***	0.009***	0.015***	0.020***
	(13.96)	(8.07)	(4.84)	(6.57)	(8.51)
Tenure squared	-0.000***	-0.000***	-0.000	-0.000***	-0.000***
	(6.58)	(4.27)	(1.55)	(3.39)	(4.26)
Degree	0.385***	0.368***	0.373***	0.367***	0.399***
	(36.92)	(23.71)	(18.34)	(12.34)	(14.24)
Other higher education	0.268***	0.234***	0.251***	0.258***	0.276***
	(25.54)	(14.77)	(11.81)	(8.40)	(10.42)
A-level	0.187***	0.157***	0.179***	0.188***	0.161***
	(22.46)	(13.17)	(11.09)	(7.16)	(6.28)
O-level	0.138***	0.116***	0.124***	0.172***	0.110***
	(16.07)	(8.81)	(8.44)	(6.23)	(4.57)
Other qualifications	0.079***	0.061***	0.069***	0.121***	0.052**
	(8.90)	(4.64)	(4.46)	(4.15)	(2.05)
Female	-0.111***				
	(12.82)				
Married	0.087***	0.073***	0.019**	0.053***	-0.000
	(12.67)	(8.81)	(1.97)	(3.47)	(0.03)
Female * married	-0.089***				
	(8.91)				
Non-permanent job	0.026**	0.033*	0.038	-0.001	-0.017
	(2.17)	(1.67)	(1.57)	(0.02)	(0.73)
Manager	0.351***	0.356***	0.396***	0.367***	0.390***
	(29.61)	(20.84)	(14.36)	(12.97)	(11.41)
Professional	0.333***	0.286***	0.446***	0.408***	0.492***
	(23.56)	(14.21)	(12.17)	(12.87)	(13.10)
Assoc professional	0.281***	0.268***	0.342***	0.285***	0.334***
	(22.02)	(13.92)	(11.46)	(9.82)	(10.08)
Clerical	0.111***	0.040**	0.197***	0.036	0.185***
	(9.34)	(2.08)	(7.48)	(1.21)	(5.91)
Craft	0.118***	0.138***	0.025	0.096***	0.109
	(9.78)	(8.35)	(0.78)	(3.12)	(1.20)

(Continued over)

Table 4 continued

	All	Private sector		Public sector	
		Men	Women	Men	Women
Personal & protective	0.100***	0.011	0.082***	0.236***	0.155***
	(7.75)	(0.45)	(2.85)	(8.74)	(4.92)
Sales	0.118***	0.150***	0.138***	0.128	0.236***
	(8.05)	(7.03)	(4.76)	(0.94)	(2.66)
Machine operative	0.061***	0.053***	0.078***	0.059*	-0.011
	(5.06)	(3.20)	(2.64)	(1.67)	(0.14)
Public sector	0.010				
	(1.16)				
Firm size 25–49 employees	0.063***	0.060***	0.075***	0.033	0.058***
	(8.46)	(5.47)	(5.37)	(1.43)	(3.03)
Firm size 50+ employees	0.113***	0.133***	0.128***	0.085***	0.036**
	(20.19)	(15.99)	(12.30)	(5.03)	(2.54)
Recognised union	0.028***	0.027***	0.022**	0.020	0.079***
	(5.06)	(3.36)	(2.07)	(1.12)	(4.55)
Constant	-93.005***	85.549***	-144.162***	-112.500**	-170.729***
	(7.02)	(2.92)	(4.46)	(2.51)	(7.36)
Observations	26325	12838	6899	3142	3446
R-squared	0.55	0.50	0.54	0.51	0.54

Notes: (i) Dependent variable is log of gross annual earnings, derived from variable GRSSWK, the gross pay in the main job from the last pay period expressed as a weekly equivalent; (ii) Dummy variables for one-digit industry and region are also included; (iii) Absolute value of t statistics in parentheses; (iv) * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5
Earnings, weekly work hours and annual work weeks – robustness checks

	All	Private sector		Public sector	
		Men	Women	Men	Women
Excluding proxy responses					
Marginal effect of work hours at mean hours	0.81	0.69	0.84	0.84	0.55
Marginal effect of work weeks at mean weeks	-2.09	-2.13	-2.40	-2.63	-2.11
Observations	18690	8141	5473	2204	2872
Excluding non-permanent workers					
Marginal effect of work hours at mean hours	0.77	0.65	0.71	0.80	0.55
Marginal effect of work weeks at mean weeks	-2.23	-2.35	-2.45	-2.42	-2.25
Observations	15635	7343	4352	1918	2122
Excluding observations where net pay not usual amount					
Marginal effect of work hours at mean hours	0.78	0.66	0.77	0.77	0.56
Marginal effect of work weeks at mean weeks	-2.39	-2.39	-2.79	2.97	-2.10
Observations	25278	12421	6627	2993	3237
Including teachers					
Marginal effect of work hours at mean hours	0.78	0.69	0.80	0.70	0.54
Marginal effect of work weeks at mean weeks	-2.03	-2.19	-2.41	-2.00	-1.73
Observations	27589	12865	6949	3589	4186
Omitting controls for occupation					
Marginal effect of work hours at mean hours	0.86	0.77	0.90	0.80	0.68
Marginal effect of work weeks at mean weeks	-2.58	-2.83	-3.05	-3.00	-2.24
Observations	26325	12838	6899	3142	3446
Dependent variable = log hourly earnings, no controls for hours, weeks of holiday entitlement					
Marginal effect of weeks of holiday entitlement	0.044	0.044	0.059	0.043	0.020
Observations	26325	12838	6899	3142	3446

Notes: (i) Unless otherwise stated, the dependent variable is the log of gross annual earnings derived from variable GRSSWK, the gross pay in the main job from the last pay period expressed as a weekly equivalent; (ii) Unless otherwise stated, other controls are age (squared), tenure (squared), highest educational qualification, marital status, gender and its interaction with marital status (in the pooled regression), non-permanent employment, one-digit occupation and industry, public sector (in the pooled regression), firm size, recognised union and region; (iii) In the bottom panel, the dependent variable is the log of GRSSWK/TTUSHR, where TTUSHR is the total usual weekly hours in the main job. (iv) Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
Earnings, weekly work hours and annual work weeks – fixed effects estimates, all employees, before introduction of WTR

Variable	Coeff (t)	Variable	Coeff (t)
log (weekly hours)	3.078	Non-permanent job	0.107*
	(1.64)		(1.90)
log (weekly hours) squared	-0.350	Manager	0.039
	(1.42)		(0.37)
Marginal effect of work hours at mean hours	*0.44*	Professional	0.035
			(0.27)
log (annual weeks)	52.136**	Assoc professional	-0.022
	(2.11)		(0.20)
log (annual weeks) squared	-6.914**	Clerical	-0.005
	(2.15)		(0.05)
Marginal effect of work weeks at mean weeks	*-1.24*	Craft	0.065
			(0.62)
Age	0.204	Personal & protective	-0.019
	(1.22)		(0.17)
Age squared	-0.001**	Sales	0.067
	(2.58)		(0.53)
Tenure	0.019**	Machine operative	0.085
	(2.27)		(0.78)
Tenure squared	-0.001**	Public sector	0.170**
	(2.07)		(2.06)
Degree	0.289***	Firm size 25–49 employees	0.042
	(3.09)		(1.08)
Other higher education	0.093	Firm size 50+ employees	0.050
	(1.11)		(1.30)
A-level	0.036	Recognised union	0.023
	(0.62)		(0.80)
O-level	0.018	Changed jobs	0.063*
	(0.30)		(1.66)
Other qualifications	0.004	Year 1998	-0.065
	(0.08)		(0.39)
Married	0.151*	Constant	-105.567**
	(1.68)		(2.21)
Female * married	-0.070	Observations	2234
	(0.62)	Number of individuals	1117

Notes: (i) Dependent variable is log of gross annual earnings derived from variable GRSSWK, the gross pay from the last pay period expressed as a weekly equivalent; (ii) Dummy variables for one-digit industry are also included; (iii) Absolute value of t statistics in parentheses; (iv) * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7
Earnings, weekly work hours and annual work weeks – fixed effects estimates, all employees, including introduction of WTR

Variable	Coeff (*t*)	Variable	Coeff (*t*)
log (weekly hours)	1.991**	Other qualifications	0.049*
	(1.97)		(1.92)
log (weekly hours) squared	-0.213	Married	0.014
	(1.61)		(0.27)
Marginal effect of work hours at mean hours	*0.39*	Female * married	-0.023
			(0.35)
log (weekly hours) * WTR	0.780	Non-permanent job	-0.038
	(0.20)		(1.34)
log (weekly hours)^2 * WTR	-0.101	Manager	0.158***
	(0.19)		(2.86)
Additional effect of work hrs for WTR-affected group	*0.02*	Professional	0.133**
			(1.99)
log (annual weeks)	36.759**	Assoc professional	0.130**
	(2.14)		(2.24)
log (annual weeks)^2	-4.853**	Clerical	0.068
	(2.17)		(1.30)
Marginal effect of work weeks at mean weeks	*-0.70*	Craft	0.010
			(0.19)
log (annual weeks) * WTR	-86.798*	Personal & protective	0.059
	(1.67)		(1.01)
log (annual weeks)^2 * WTR	11.357*	Sales	0.147**
	(1.69)		(2.24)
Additional effect of work wks for WTR-affected group	*0.88*	Machine operative	0.046
			(0.93)
WTR * year 1998	0.023	Public sector	0.048
	(0.70)		(1.52)
Age	0.173*	Firm size 25–49 employees	0.015
	(1.74)		(0.74)
Age squared	-0.001**	Firm size 50+ employees	0.041**
	(2.42)		(2.11)
Tenure	0.013***	Recognised union	0.015
	(2.89)		(1.06)
Tenure squared	-0.000**	Changed jobs	0.071***
	(2.05)		(3.52)
Degree	0.113**	Year 1998	-0.082
	(2.12)		(0.83)
Other higher education	0.049	Constant	-68.056**
	(1.12)		(2.11)
A-level	0.031	Observations	7158
	(1.00)	Number of individuals	3579
O-level	0.033		
	(1.05)		

Notes: (i) Dependent variable is log of gross annual earnings derived from variable GRSSWK, the gross pay from the last pay period expressed as a weekly equivalent; (ii) WTR is a dummy variable equal to 1 if a person was entitled to less than 15 days' holiday in 1997 and was observed after the introduction of the WTR in 1998 (WTR equals zero otherwise); (iii) Dummy variables for one-digit industry are also included; (iv) Absolute value of t statistics in parentheses; (v) * significant at 10%; ** significant at 5%; *** significant at 1%

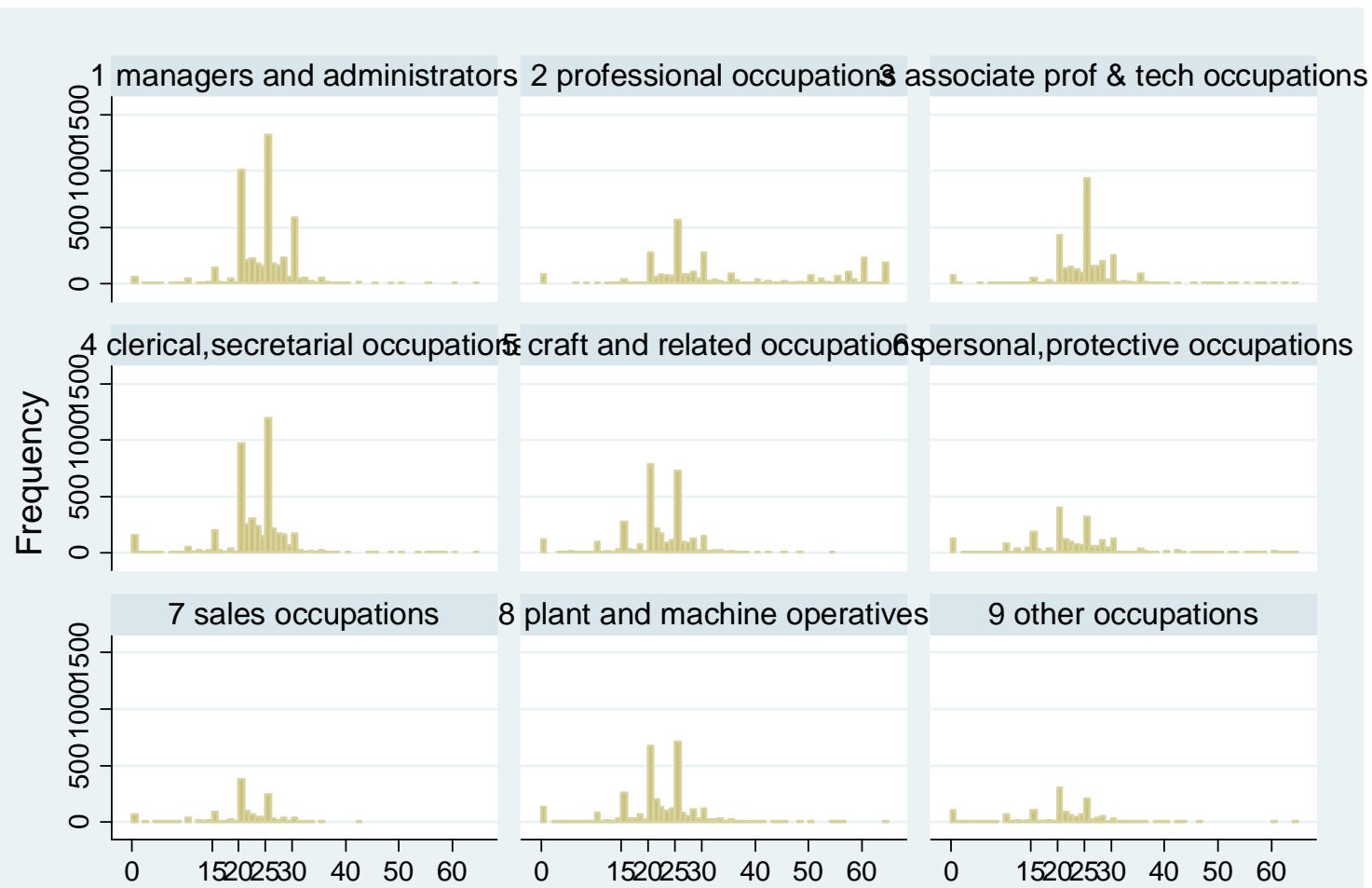Figure 1: Days of paid holiday entitlement - FT employees
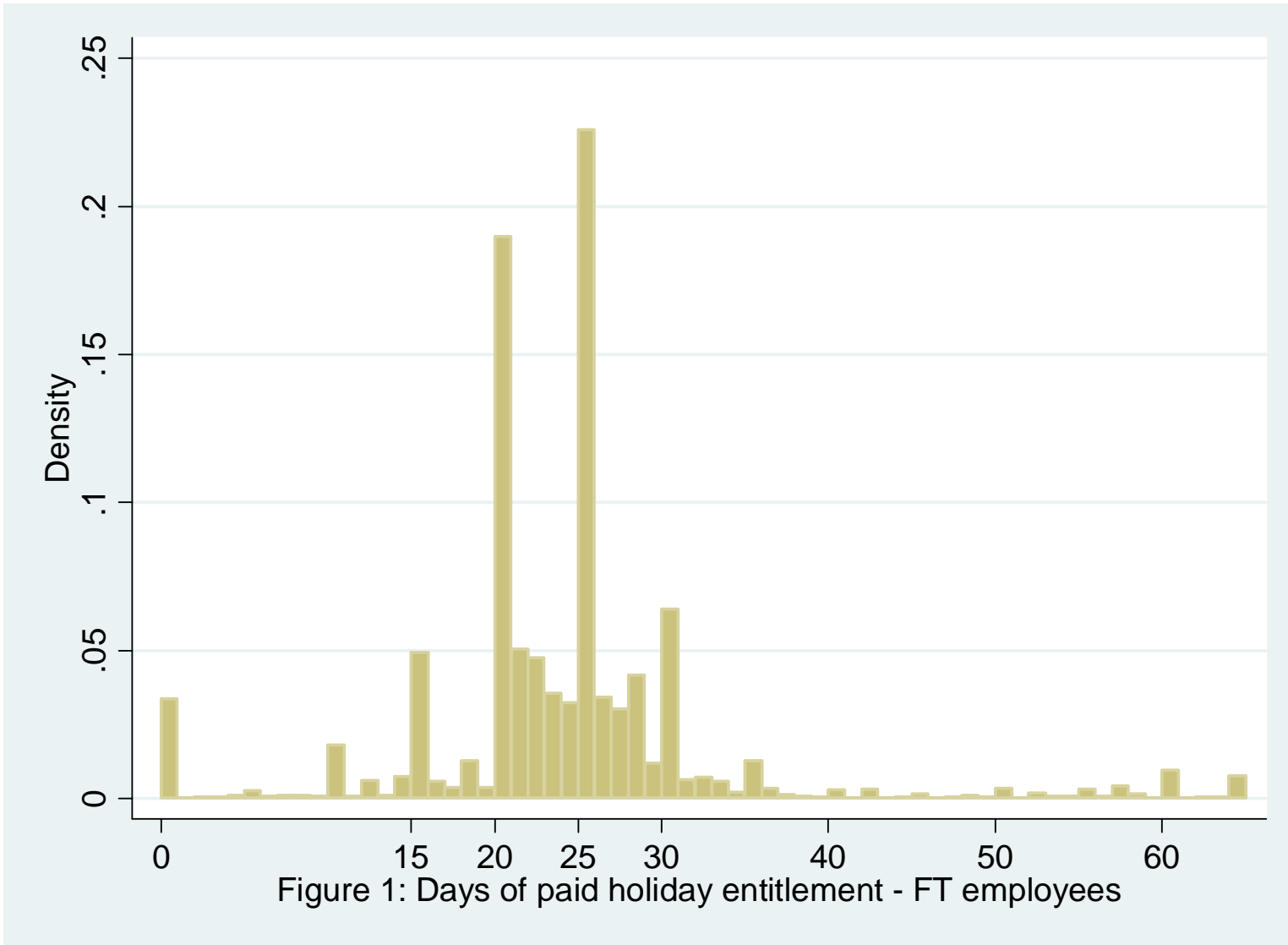
Figure 2: Days of paid holiday entitlement - FT employees

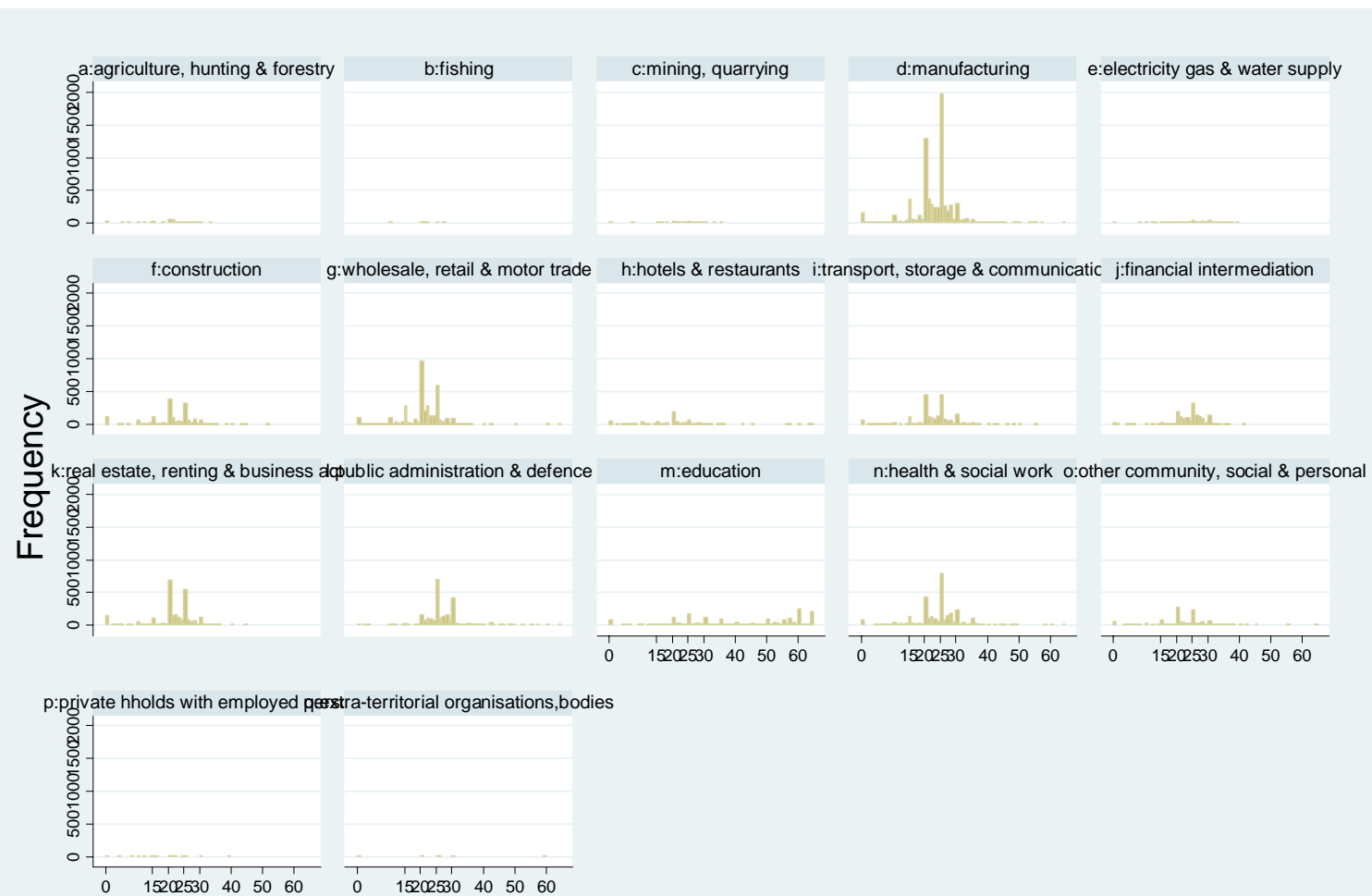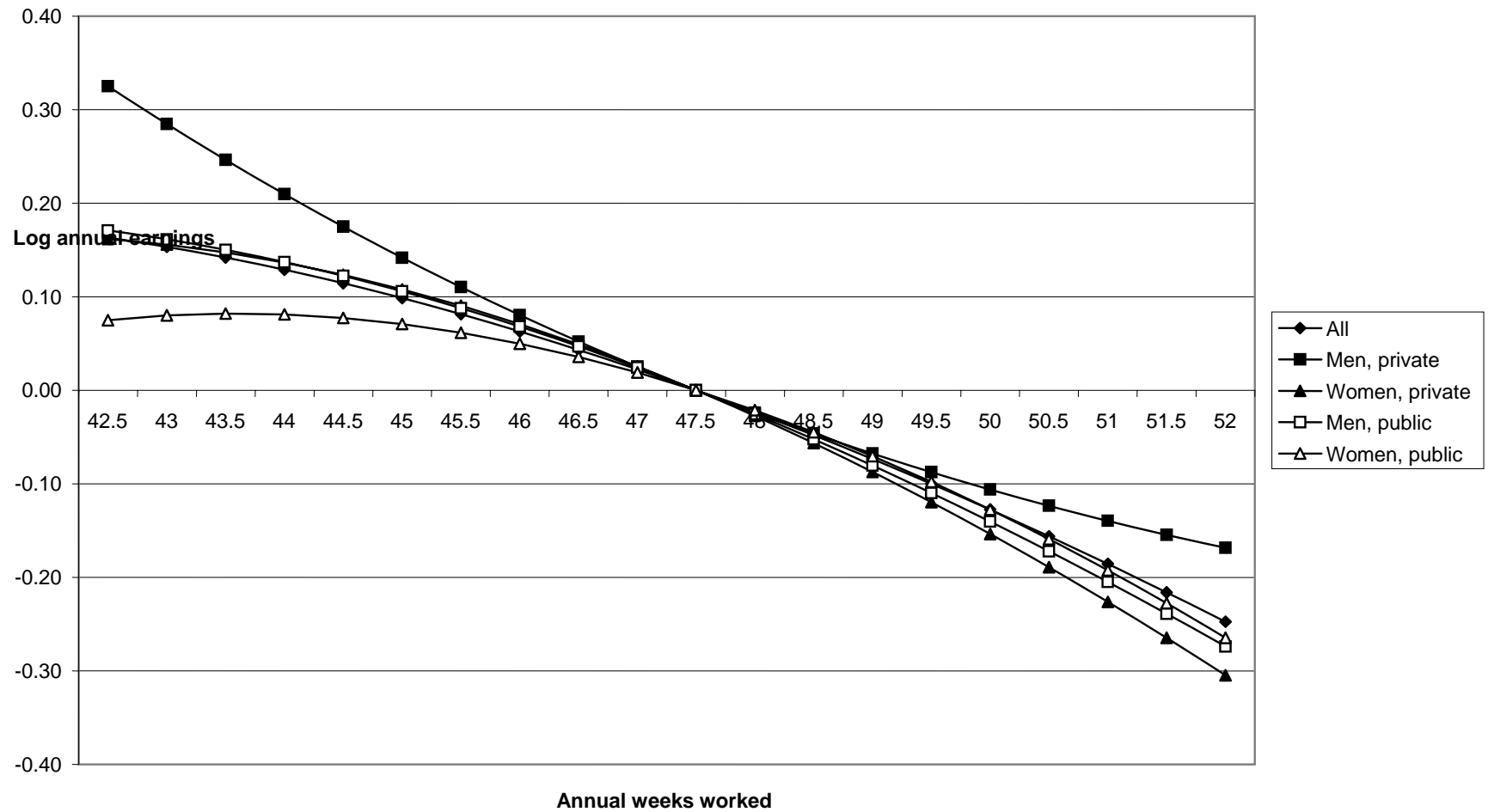Graphs by major occupation group (main job)

Figure 3: Days of paid holiday entitlement - FT employees

Graphs by industry section (main job)

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Figure 4 - Effect of annual weeks worked on annual earnings

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