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# Wages, Hours, and Overtime Premia: Evidence from the British Labor Market

## **Abstract**

Unlike the United States, Britain has no national laws regulating overtime hour assignment or compensation. Using individual-level data on male nonmanagerial workers from the 1998 British New Earnings Survey, the authors investigate relationships among the standard hourly wage rate, hourly earnings (including overtime), the overtime premium, and the length of overtime hours. They find that when overtime is accounted for, average hourly wage earnings are fairly uniform across firms in a given industry, because firms paying belowmarket- level straight-time wages tend to award above-market-level overtime premiums, and, conversely, firms paying above-market-level straight-time wages provide below-market-level overtime premiums.

# WAGES, HOURS, AND OVERTIME PREMIA: EVIDENCE FROM THE BRITISH LABOR MARKET

DAVID N. F. BELL and ROBERT A. HART\*

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Unlike the United States, Britain has no national laws regulating overtime hour assignment or compensation. Using individual-level data on male non-managerial workers from the 1998 British New Earnings Survey, the authors investigate relationships among the standard hourly wage rate, hourly earnings (including overtime), the overtime premium, and the length of overtime hours. They find that when overtime is accounted for, average hourly wage earnings are fairly uniform across firms in a given industry, because firms paying below-market-level straight-time wages tend to award above-market-level overtime premiums, and, conversely, firms paying above-market-level straight-time wages provide below-market-level overtime premiums.

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Many models of firm and household behavior incorporate the overtime premium to represent the increment to basic pay necessary to extend labor utilization beyond maximum standard hours. It is a particularly important variable in the study of policy initiatives to encourage work sharing. In the United States, it is central to the debate on the effects of the Fair Labor Standards Act (FLSA) on working time and employment (Ehrenberg and Schumann 1982; Trejo 1991; Hamermesh and Trejo 2000). In Europe, it plays an important

role in studies that investigate the effects of government interventions to reduce the basic workweek (Hart 1987; Calmfors and Hoel 1988; Hunt 1999). It is also featured in macroeconomic analysis, and especially in studies of marginal cost and price over the business cycle (Bils 1987; Hart and Malley 2000).

In most work involving the premium, standard-time and overtime pay in the firm are represented in a very simple way. Typically, the firm is assumed to employ a homogeneous work force, with weekly hours the same for all workers and overtime hours remunerated at a single premium rate. The total payroll of an overtime firm,  $P$ , is given by

$$(1) \quad P = (wh_s + p w v)N,$$

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Copies of the computer programs used to generate the results presented in the paper and additional analyses are available from the first author at the Department of Economics, University of Stirling, Stirling FK9 4LA, Scotland.

where  $w$  is the standard hourly wage rate,  $p$  is the overtime premium,  $h$  is total weekly hours,  $h_s$  is standard weekly hours,  $v (= h - h_s)$  is overtime hours, and  $N$  is the number of workers.

The key difference between the U.S. and British labor markets with respect to the payroll is that  $p$  is set exogenously in the former while it is a choice variable in the latter. In the United States, workers covered by the FLSA must be paid at least 1.5 times standard hourly rates for weekly hours in excess of 40.<sup>1</sup> No such requirement exists in Britain.

In most studies, workers and overtime hours are treated as endogenous variables while, typically, standard hours are taken to be exogenously determined.<sup>2</sup> Differences occur, however, over the treatment of the standard hourly wage rate and the overtime premium. Two main types of working time contract—which might be explicit or implicit—are described in the literature. In the standard model of labor demand—the so-called *fixed wage model*—it is assumed that the standard wage and the premium are set exogenously. Primary interest focuses on the work sharing effects of changes in standard hours or standard wages or the overtime premium. Thus, a rise in  $p$  may encourage work sharing by inducing the firm to substitute employment for overtime hours. The substitution effect may be offset by a negative employment scale effect, because a rise in  $p$  also serves to increase

total payroll costs. In an alternative model—the *fixed job model*—developed by Lewis (1969), the firm and its work force jointly determine long-term contracts concerning per-period earnings. The wage rate and hours are chosen to reflect workers' supply and the firm's demand preferences. Suppose under these circumstances that the government mandates a rise in  $p$ . To avoid potential adverse employment and labor relations consequences of a *ceteris paribus* rise in the total payroll, the parties simply allow an offsetting reduction in  $w$  that re-establishes their contractually agreed-upon level of earnings.

The early U.S. literature and the bulk of the European literature have been dominated by the labor demand model, while more recent U.S. research has given strong consideration to the fixed job model. Here, we investigate the extent to which these approaches offer insights into relationships among wages, the premium, and working time in Britain, a market that does not regulate the premium.

We make use of Europe's richest source of statistics on working time and employment, the British New Earnings Survey (NES). The NES provides individual-level data obtained from employers' payroll tax records. In Britain, there have not been, until recently, any government regulations concerning either the length of working hours or the levels of overtime premia.<sup>3</sup> We concentrate on non-managerial men for the year 1998, with a sample size of 24,000 workers.<sup>4</sup> The main comparative advan-

<sup>1</sup>Of course, statutory overtime rules do not mean, *per se*, that the premium must assume some given value in a firm; the firm may choose to set a premium above the prescribed minimum. The critical point is that the mandated U.S. premium is at such a high level that very few firms diverge from it (Hart and Malley 2000). In most major industrialized countries, either minimum premium rates are significantly lower than in the United States or no overtime compensation rules are imposed outside of individual collective bargaining agreements (OECD Employment Outlook 1998).

<sup>2</sup>In unregulated markets like Britain's, it is not uncommon for the firm to follow industry-level or public sector norms over the length of the standard workweek.

<sup>3</sup>The Working Time Regulations that were introduced in 1998 implemented the European Working Time Directive. These ostensibly set a ceiling of 48 hours on the working week. However, workers can choose to work beyond this limit by signing an opt-out. The regulations have no bearing on the current empirical work; they took effect approximately 6 months after the collection of the data used in this study.

<sup>4</sup>About 35% of total male workers and 18% of women in the 1998 NES sample worked overtime. Of the non-managerial men studied here, 49% worked overtime.

tage of the data is that they provide breakdowns of each component part of the average hourly wage rate, including the average overtime premium.

### The Fixed Job and Constant Average Wage Models

In efficient long-term contracts, the bargaining parties must set hours as well as wages. Arriving at mutual agreements over standard and overtime pay rates and hours involves complicated bargaining agendas. Potential transaction costs of bargaining are considerably reduced, however, when the parties concentrate on two key variables, the length of paid working time and average hourly earnings. A particularly simple way of dealing with hours and hourly compensation is to view them as the outcome of joint determination by the firm and its work force (Lewis 1969; Rosen 1974). Lewis defined a "market equalizing wage curve" in which the market wage is postulated to depend on average hours. Then, in a simplified version of the model, the employer minimizes labor cost per unit of labor input—also expressed in terms of a wage-hours trade-off—subject to the constraint of the market curve. The optimal wage-hours combination then defines contractual long-run wage earnings.

In what follows, we assume that there is no short-time working; individuals work *either* maximum standard weekly hours *or* maximum standard plus overtime hours.<sup>5</sup> Suppose that the firm's work force is homogeneous, with the length of weekly hours equal across workers. Let  $a$  be average hourly earnings (that is, including overtime). Average weekly earnings are defined as

$$(2) \quad y = ah = h_s w + p w v.$$

Suppose that  $y$  in (2) represents payment under an efficient long-term contract.

Moreover, as in the United States, let the levels of  $h_s$  and  $p$  be government-determined. What if, *ex post*, the government decrees that the overtime premium is to be  $\hat{p}$  where  $\hat{p} > p$ ? *Ceteris paribus*, average weekly earnings,  $\hat{y}$ , would exceed  $y$  since part of the week is compensated at the premium rate; that is,  $\hat{y} = w h_s + w \hat{p}(h - h_s) > y$ . For its part, the firm would be unhappy, since unit costs would rise without extra production. But what if  $w$  is flexible? Then, trivially, the parties could stick to their original agreement by setting a new wage,  $\hat{w}$ , such that  $\hat{w} h_s + \hat{w} \hat{p}(h - h_s) = a h = y$ . The hourly wage is adjusted sufficiently downward to ensure that the add-on cost due to the mandatory rise in the premium is neutralized.

What about such long-term contracts in a market like Britain in which both  $w$  and  $p$  are set within the firm? Contract efficiency in these circumstances implies that the overtime premia are indeterminate.<sup>6</sup> We would expect, therefore, that there would be no systematic patterns in the premia. However, anticipating the results below (see Figures 1 and 2), we do find that premia exhibit significant regularities. Moreover, the first two moments of premium rates are independent of overtime hours worked.

One possible explanation of these findings is as follows. In order to avoid establishing a myriad of agreements involving widely diverse overtime rules, firms and workers resort to custom and practice when setting overtime premia.<sup>7</sup> These are effec-

<sup>6</sup>We are grateful to one of the referees for making several useful suggestions concerning the remaining arguments in this section.

<sup>7</sup>It is common in British collective bargaining agreements for premium rates to be laid-down, leaving the parties to bargain over the standard rates of pay to which the premia apply. Based on a sample of British companies, Incomes Data Services (1997) report that the basic time rate plus one-half or one-third or one-quarter are the most commonly observed overtime payments. Some companies pay two-tier rates; for example, higher rates may apply to weekend working. Not all of these companies negotiate rates via collective bargaining. Of course, non-unionized firms can easily adopt the premia established under collective

<sup>5</sup>Overwhelmingly, full-time workers in the European Community work, at least, maximum "laid-down" (mandated) standard weekly hours.

tively anchored by the acceptance of a set of established "norms," thereby circumventing the indeterminacy problem. Whether a firm faces a relatively high or low premium is not dependent on its contracted length of overtime hours. Of course, custom and practice will vary across sectors. Contract efficiency will demand that in competitive markets, firms subject to norms that oblige them to pay high premium rates will tend to have offsetting low basic wage rates, and firms in sectors with customarily low premium rates will tend to have high basic wage rates.

Consider equation (2) re-written in terms of average hourly earnings, or

$$(3) \quad a = \frac{w(h_s + pv)}{h_s + v}.$$

Following the previous discussion, suppose that  $p$  is set within each firm on the basis of established custom and practice. Imagine competitive firms 1 and 2 facing identical work/leisure preferences of workers and identical cost schedules. Let  $h_s$  be set exogenously and at the same level in the two firms. Optimization will ensure that the firms set the same total hours and average hourly wage rate. We assume that the former are given by  $h_s + v$ . If, due to custom and practice, firm 1 faces a higher  $p$  than firm 2, it will simply set a relatively low  $w$  so as to equalize  $a$ . Such a trade-off is in the spirit of the Lewis fixed-job model. It runs parallel to the U.S. work on the wage effects of statutory changes in the premium.

Continue to let  $h_s$  be constant across firms. We know, however, that overtime hours ( $v$ ) vary. This variation can arise for two reasons. First, workers differ in their preferences for hours depending on such factors as family circumstances and attitudes to work. Second, firms face different cost curves (mapping out the relationship between the hourly wage and numbers of

hours worked). Again, let  $p$  and  $v$  be independent. Then, what can we say about the association between  $a$  and  $v$ ? If we follow the extended approach of Lewis (1969), incorporating both demand and supply influences within the firm, this relationship is a hedonic locus that reflects both preferences of workers and the interests of firms. The relationship is not necessarily positive (that is, with higher hourly average earnings being associated with longer hours). Indeed, it could be negative over a range of hours. Lewis showed that if all employees faced an identical set of work/leisure preferences, the market wage-hours relationship would represent a segment of individuals' indifference curves, defined in wage-hours space, which are U-shaped. By contrast, if all employers faced an identical set of isocost schedules, the market curve would represent a segment of an inverted U. In reality, the market average wage curve can take any shape between these extremes. One possible outcome is the finding of a constant average wage curve, although this would represent a very special set of circumstances in Lewis's scheme.

What if we moved more toward the fixed wage model in this extended framework? Rather than attempt to reach internal agreements with respect to divergent supply and demand objectives, firms and workers may opt to enter into implicit contracts that specify the length of total hours to be worked at a constant, market-determined, hourly wage rate. Given the wide range of working hours we observe in our British data, the formulation of such contracts would require divergent working time preferences, at given market wages, across firms and individuals. Advantages may arise from two further cost considerations. First, such contracts would limit potential transaction costs associated with attempts to reach individually tailored agreements that embrace the utility aspirations of the two parties. Second, and relatedly, these contracts would reduce problems associated with information asymmetry between the parties concerning their working time/wage preferences. This may be labeled the *constant average wage model*.

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bargaining agreements of competing firms. Interestingly, our evidence (see Table 1) shows that the average overtime premium is the same for covered and non-covered establishments.

Table 1. Wages, Overtime Premium, and Weekly Hours in Britain: Non-Manual Men, 1998.  
(Standard Deviations in Parentheses)

Description	All Workers		Workers Covered by Collective Agreements	
	Total	Working Overtime	Total	Working Overtime
Hourly Standard Wage Rate (£)	7.5 (2.8)*	7.5 (2.6)	7.8 (2.8)	7.8 (2.7)
Average Overtime Premium	—	-1.28 (0.31)	—	-1.26 (0.32)
Weekly Standard Hours	39.1 (3.8)	39.0 (3.3)	38.8 (3.7)	38.8 (3.3)
Weekly Overtime Hours of Overtime Workers	—	-9.0 (7.9)	—	-9.0 (8.1)
Sample Size	24,447	15,912	14,139	9,323

As we have already noted, the maintenance of a constant  $a$  in (3) implies a negative association between the overtime premium and the basic wage. Further, for given  $p$ , higher overtime hours must be remunerated at a lower standard wage in order to maintain constant average earnings over the range of overtime hours.<sup>8</sup>

### Evidence from the British New Earnings Survey

The British NES provides data on individual workers based on establishment records during a given week in April. We concentrate attention on full-time non-managerial male workers in 1998.<sup>9</sup> The

data contain information on collective bargaining. The NES covered 62 collective agreements that affected workers' pay either directly or indirectly in 1998. Fifty-eight percent of our sample is covered by such agreements. All major industries are comprised of a mix of covered and uncovered firms.<sup>10</sup> One unusual feature of the NES data that is crucial for our purposes is its provision of information on the pay and hours components of the average overtime premium. Thus, we have access to all the information needed to calculate each of the component parts in (3).

Table 1 provides a basic data summary. Weekly overtime hours in Britain are the highest in Europe, averaging 9 weekly hours for workers working overtime in our sample. The average overtime premium for these workers is 1.28 times the standard rate. Average standard hourly wages and hours

<sup>8</sup>Totally differentiating (3), treating  $h_s$  as exogenously determined, we obtain

$$\frac{\partial w}{\partial v} = \frac{a - wp}{h_s + pv} + \frac{\partial a}{\partial v} \left( \frac{h_s + v}{h_s + pv} \right) - \frac{\partial p}{\partial v} \left( \frac{wp}{h_s + pv} \right).$$

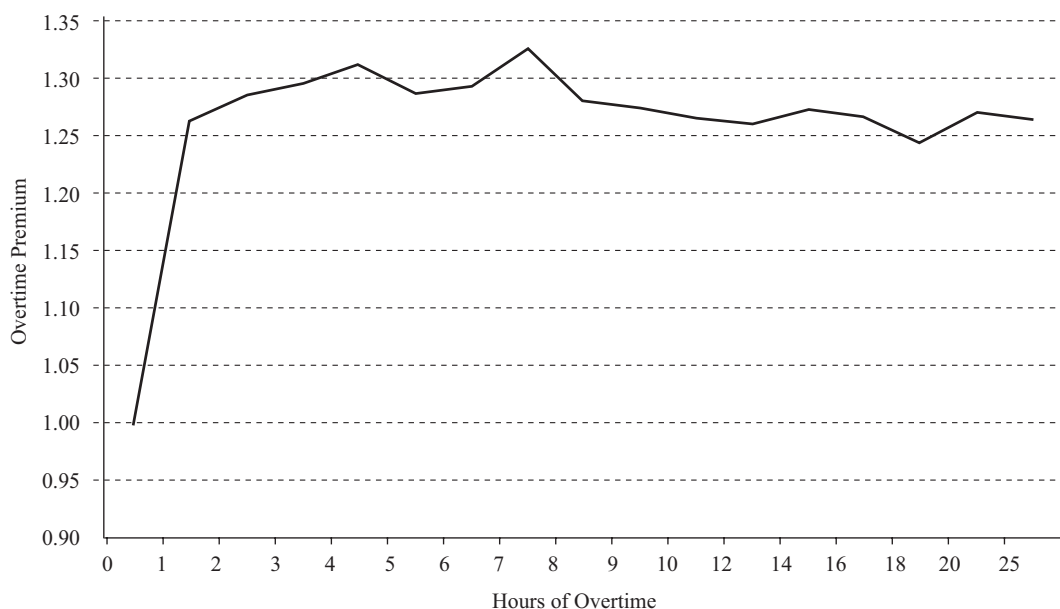
A constant average wage requires that  $\partial a / \partial v = 0$ . If the premium is independent of overtime hours, then  $\partial p / \partial v = 0$ . Under these conditions it follows that  $\partial w / \partial v < 0$ , since  $a < wp$  in the first term on the right-hand side of the above expression.

<sup>9</sup>Full-time men are defined in the data as those who work at least 30 hours per week. We exclude men in professional and managerial occupations; in general, overtime is not explicitly remunerated for these job categories. We exclude individuals who were reported to have a premium greater than three times

the standard rate. We include individuals reported to have a premium less than unity (that is, whose overtime hours were paid at a rate below the standard rate).

<sup>10</sup>There are several large pockets of unionism in the public sector but, in general, no major domination at industry level. In transport, for example, rail transport is dominated by workers covered by agreements, but this competes with road transport, a much larger sector, where the majority of workers are not covered.



*Figure 1. Average Premium by Hours of Overtime.*

do not differ between overtime and total workers. In general, there is very close correspondence between wage, premium, and hours sample means for covered and uncovered workers.

We now turn to the relationships among the premium, average overtime hours, and the standard hourly wage rate in relation to average hourly earnings in equation (3). It turns out that several remarkably strong and simple patterns emerge that, collectively, translate into support for the constant average wage model.

The shape of the average premium schedule is shown in Figure 1. The evidence indicates that the premium is independent of the length of overtime hours. Between 0 and 2 weekly hours of overtime, the average premium rises steeply to between 1.25 and 1.35 times the standard rate, a level it then maintains with high constancy as weekly overtime hours rise.<sup>11</sup> This finding cor-

roborates the earlier analysis of Hart and Ruffell (1993).

Of course, we are using aggregated data, and the premium is averaged across both firms and individuals. There are inter- and intra-firm differences in the average lengths of overtime hours and in the premium overtime rates. Figure 1 is consistent with the conjecture that the first moment of the distribution of premium rates is invariant to the length of overtime hours. To check the distribution more extensively, we di-

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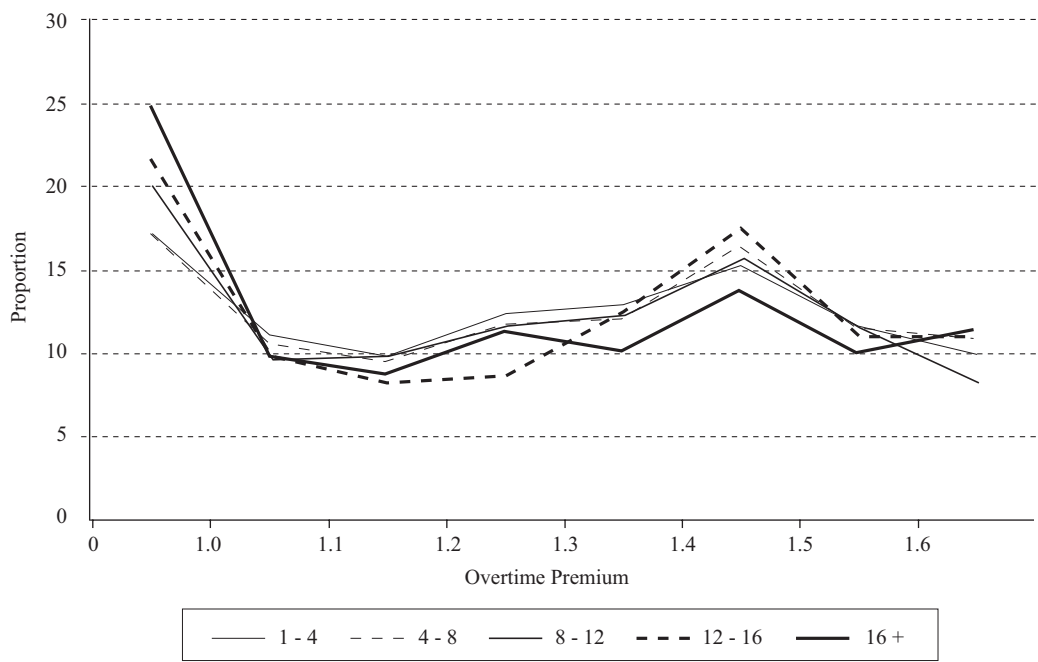
the influence of workers who receive a premium of less than one. There are 2,956 such individuals in our sample. Of these, 31.3% worked 14 or more overtime hours per week. As a possible explanation for this apparent anomaly, a referee suggested that a strong desire for extra income may have moved these workers to request very long hours of work, and their employers, believing that long hours adversely affect labor productivity, may have been willing to offer overtime hours only at a discounted wage. If these workers are removed from the sample, the modified Figure 1 displays remarkably little variation; above 2 hours of weekly overtime, the premium stays within the band 1.32–1.35.

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<sup>11</sup>There is a slight downward tapering of the premium at high weekly overtime hours. This reflects



Figure 2. Proportions Working Overtime by Overtime Premium.



*Note:* With one exception, the proportions working overtime in a given premium band are represented at the band's mid-point. The exception is the uppermost open band: this represents all premia greater than 1.6 and up to 3.0. These interpretations also apply to Figures 3 and 4.

vided overtime workers in the sample into groups delineated by lengths of weekly overtime hours; these range from 1–4 hours at the lower end of the spectrum to over 16 hours at the upper end. Then, we calculated the proportions of workers within each of these hours groups that fell within given bands of average overtime premiums. The results are shown in Figure 2.

The proportions of overtime workers working at given average rates are very similar across the hours groups. The widest band—covering between 17% and 25% of workers across the groups—receives a premium of less than 1 (that is, their overtime wage rate is *less* than their standard wage rate).<sup>12</sup> At higher premia, the bands are

relatively narrow: adding the contributions, between 18% and 21% receive a premium in the 1–1.2 range; between 19% and 25%, 1.2–1.4; between 24% and 29%, 1.4–1.6; and between 8% and 12%, in excess of 1.6. At least the first two moments of the distribution of the premium appear to be invariant to the number of weekly overtime hours.

Figure 3 shows that there is, predominantly, a negative relationship between the standard hourly wage rate and the premium. This occurs over the range of the premium from 1.1 to 1.55, covering 75% of the sample. If we accept the “custom and practice” conjecture concerning the level of the premium within firms, then these wage findings support the notion that firms subject to customs or practices that dictate a high premium offset the comparative cost disadvantage by paying a relatively low stan-

<sup>12</sup>Note that, in line with the discussion in the preceding footnote, those individuals working long hours of overtime form the highest percentages.

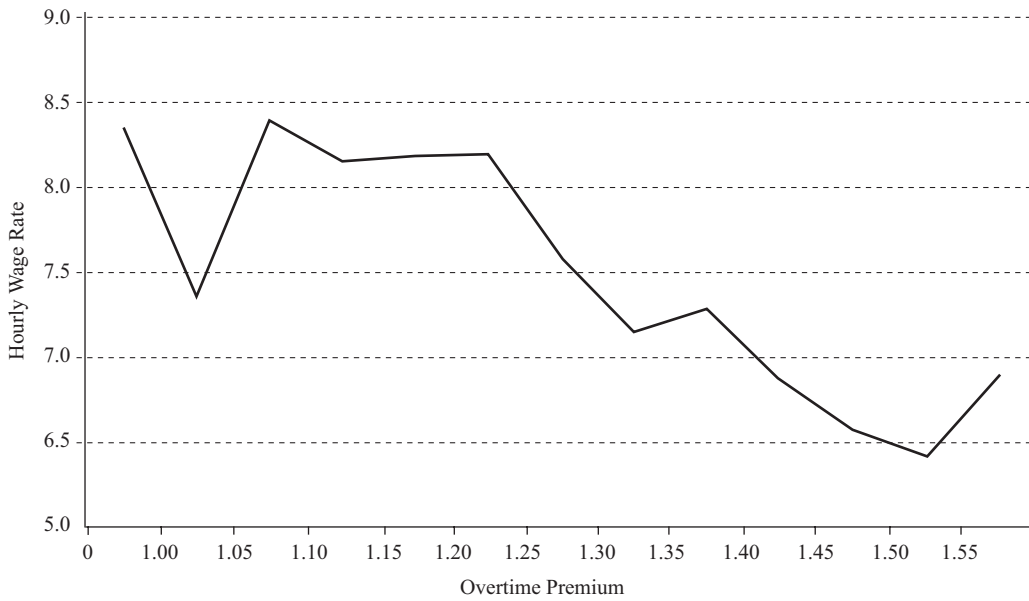
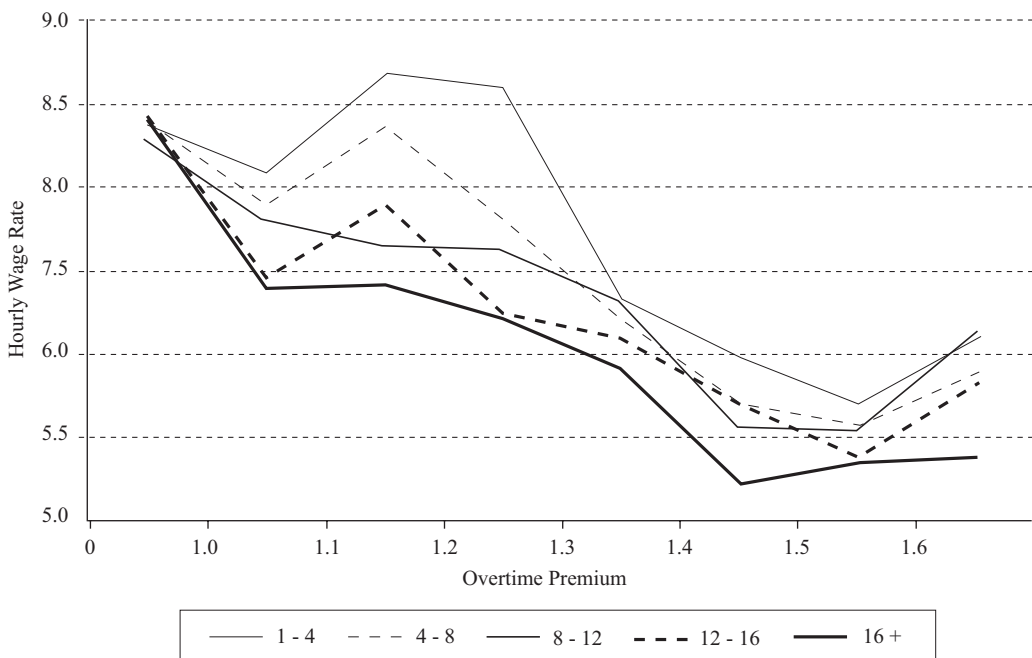
*Figure 3. The Standard Hourly Wage Rate and the Premium.**Figure 4. Standard Hourly Wage by Premium and Overtime Hours.*

Figure 5. Average Standard Hourly Wage Rate by Hours of Overtime.

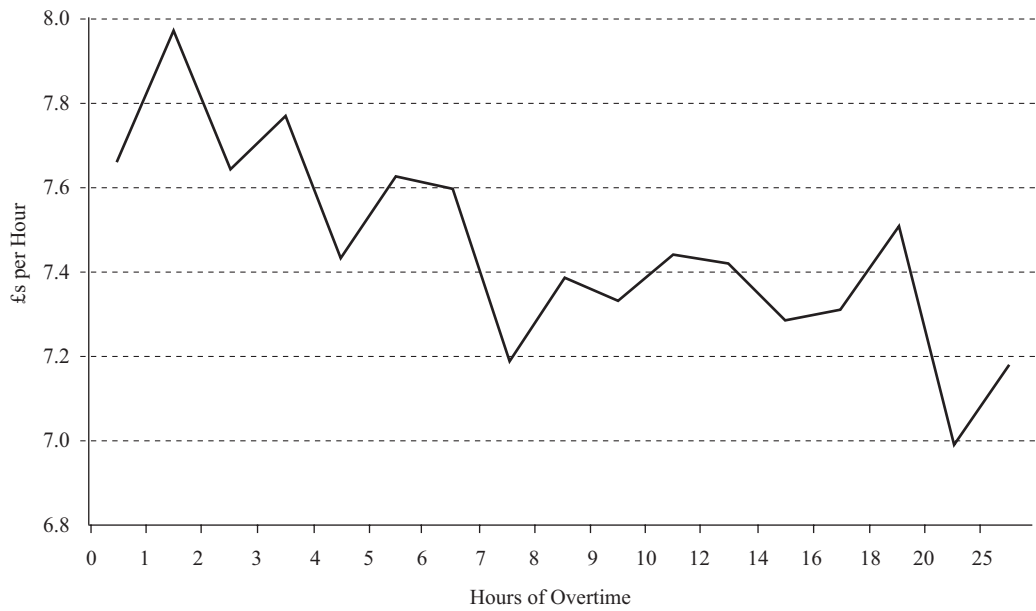


Figure 6. Average Weekly Earnings by Hours of Overtime.

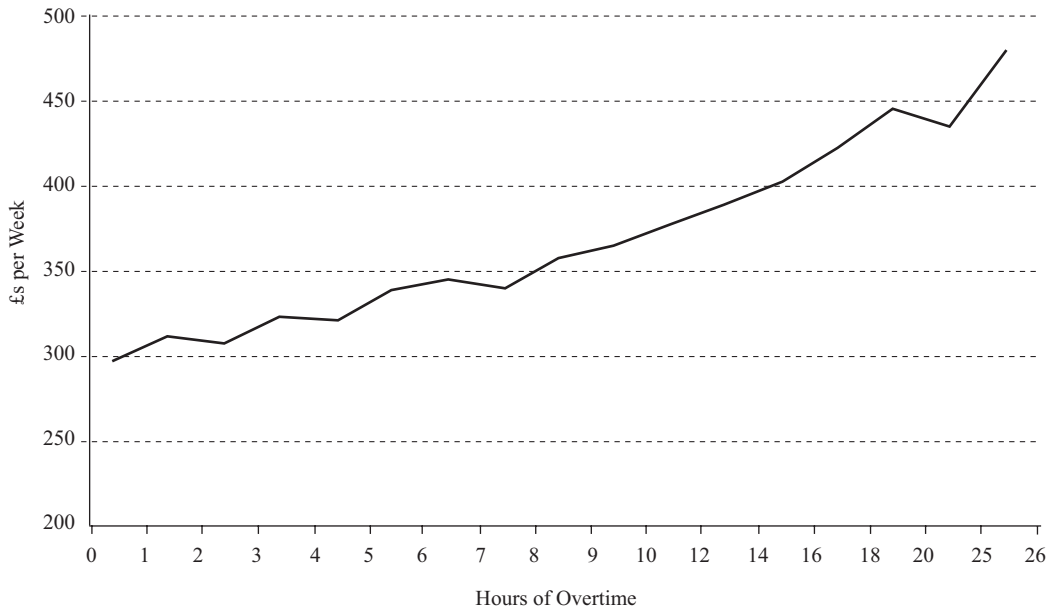
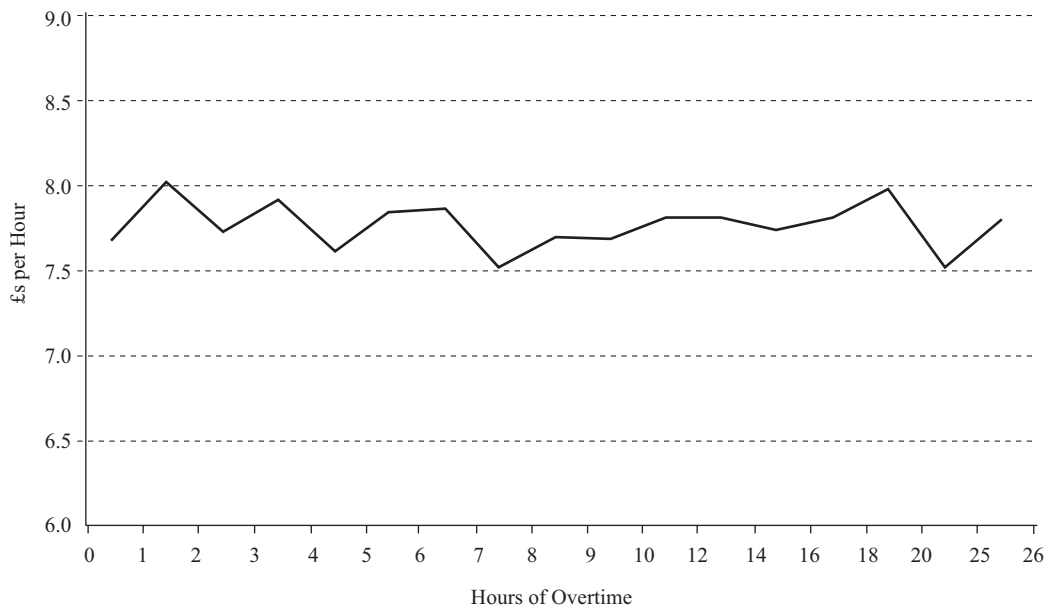


Figure 7. Average Hourly Rate of Earnings by Hours of Overtime.



dard wage, and, *vice versa*, firms among which a low premium is customary compensate workers by paying a relatively high standard wage. In Figure 4, the  $p$ - $w$  relationships are broken down into individuals experiencing different lengths of overtime hours. There are two main findings. First, the negative  $p$ - $w$  relationship is observed at all levels of overtime working. Second, at all levels of the premium, individuals working high overtime hours receive lower standard wages than do their low-overtime counterparts.

The observations in Figure 4 suggest that the standard hourly wage rate is negatively related to the length of overtime hours. That expected outcome is confirmed by the graph in Figure 5. Over the length of overtime hours, standard hourly wages fall from £8 to £7. As we have noted (see footnote 8), a negative relationship between  $w$  and  $v$  is required in order to achieve a constant average hourly wage.

The combined effects of these relationships on average earnings are shown in Figures 6 and 7. Figure 6 displays a linear relationship between average weekly wages

and overtime hours. When translated into average hourly wages, Figure 7 reveals that the average hourly wage is essentially constant in overtime hours. At all levels of overtime, the hourly wage fluctuates in the narrow band of £7.5 to £8.

### Conclusion

The labor demand model, or fixed wage model, has dominated European working time debates. Yet the evidence presented here for Britain suggests that alternative models that are based on different relationships between hours and wages might be fruitfully investigated. We conjecture that the overtime premium is essentially the outcome of established custom and practice. The evidence strongly suggests that the premium is largely independent of the length of overtime hours.<sup>13</sup> For most work-

<sup>13</sup>A possible caveat to the independence claim is the seeming tendency among some workers to accept hourly wages below standard wages (that is, a premium less than 1) for very long overtime hours.

ers, the standard hourly wage is negatively related to the premium. Recourse to the fixed job model, related to the work of H. Gregg Lewis, helps to explain these findings. In order to maintain a competitive average hourly wage, firms will offset a relatively high premium by paying a relatively low standard wage rate. But adhering to a competitive hourly wage has additional implications. It requires that overtime hours be negatively related to the standard hourly wage. This is also found to be the case in our British data. Taken together, these relationships produce an average hourly wage that is constant in the length of overtime hours. This is consistent with a model in which workers and firms enter into an implicit contract that specifies total hours at a

constant, market-determined, hourly wage rate.

These findings point away from the traditional view that firms change the length of overtime hours as a short-term response to unanticipated output fluctuations. They fit more comfortably with the notion of workers and firms agreeing on long-term overtime hours and payments structures. To the extent that this is true, there is little likelihood that the recent European Working Time Directive will have much impact on British working time practices. While this directive sets an upper ceiling of a 48-hour workweek, workers are free mutually to agree to set weekly hours beyond this limit. The indications in this study are that many individuals will prefer to opt out and work long weekly hours.

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