The Determinants of Work Effort: Evidence from the Employment in Britain Survey

by

Ken Clark*
Mark Tomlinson**

* School of Economic Studies, University of Manchester, Manchester, M13 9PL. Tel: 0161-275-3679. Fax: 0161-275-4812. Email: ken.clark@man.ac.uk

** Centre for Research in Innovation and Competition, University of Manchester, Manchester, M13 9PL. Email: mark.tomlinson@man.ac.uk.

Abstract

Using a sample of male and female workers from the 1992 *Employment in Britain* survey we estimate a model of employees' self-reported effort levels. Effort is modelled as a function of wages, the perceived monitoring and supervision environment in the individual's workplace, labour-leisure preferences, local unemployment rates and unionisation.

Using a two-step estimation strategy to account for the endogeneity of the wage, we find that effort levels are increasing in wages and in preferences for work over leisure. While the extent of monitoring seems not to affect workers' effort levels the ease with which they can be dismissed is a motivating factor. Unionisation reduces self-reported effort levels which may reflect the outcome of an effort-bargain and, in contrast to the efficiency wage shirking story, local unemployment rates do not affect effort. Finally, in spite of being paid more than women, men report exerting less effort at work.

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JEL Codes: J31, J33.

> Seest thou a man diligent in his business? He shall stand before kings.
> Proverbs 22:29.

An hour of labour is not an homogenous input to the production process of the firm. Even among workers who possess equivalent levels of human capital, who combine their labour with the same level, type and vintage of physical capital and who have identical strength or ability, there will be variations in the commitment and effectiveness with which workers apply themselves to their assigned tasks. A firm's labour productivity will depend, in short, on the effort of its workers.

Employees who are shirking, or supplying low effort, contribute less to output than those who are displaying greater commitment. Clearly, it is in the interest of demanders of labour, other things equal, to extract as much effort as possible from workers and the design of wage policies, levels of investment in supervision and monitoring technology and other measures undertaken by firms to enhance staff morale are all direct ways in which employers seek to increase effort per worker. On the supply side of the labour market, the expenditure of increased effort reduces utility. Uncompensated effort increases will have welfare implications and there are questions of equity if some workers exert less effort than others but are paid the same. For these reasons, investigating the nature and determinants of worker effort is a key component of our understanding labour as a factor of production.

In this paper we offer empirical evidence on what influences the level of effort supplied by employees. We use data on self-reported effort levels from a cross section of workers interviewed for the 1992 *Employment in Britain* (EIB) survey. Selection of appropriate explanatory variables is guided by theory and the relevant theoretical literature is briefly reviewed in section II of the paper. Logically prior is the question of what effort actually is, and in section I we consider some definitions and how effort has been modelled empirically. Section III describes the data. An econometric model is specified in section IV and the results of estimating this model using EIB data is presented in section V. Section VI concludes.

I. DEFINING AND MEASURING EFFORT

While a search of the theoretical literature unearths a considerable body of research into the determinants of "effort", the proportion of such work which attempts any substantial definition of the concept is small. It is generally taken for granted that the concept of effort has meaning and is useful. The classic efficiency wage model of Shapiro and Stiglitz (1984) defines effort in relation to shirking which in turn is described as the provision of "minimal effort" (p. 435). Yellen's (1984) survey of efficiency wage models is even less forthcoming on what effort might be and a recent labour economics textbook cites "the intensity of effort associated with each 'person hour'" (Bosworth et al., 1996, p. 9) as one of three dimensions along which labour supply can vary in the short run without any discussion of what constitutes effort. Either these authors are sufficiently convinced that an agreed definition exists that defining it would be superfluous or effort is like the proverbial elephant - difficult to describe but one knows it when one sees it.

This is not to say that the nature of effort is never discussed. The exchange of views on the importance or otherwise of the ordinality of effort involving Currie and Steedman (1993, 1997), Leslie (1995, 1997) and Skott (1997a, 1997b) offers some reflection on definitional questions. Leslie notes that the concept is "somewhat amorphous" (1995, p. 196) and quotes the view of Currie and Steedman that "effort is a multi-dimensional concept, encompassing alertness, perseverance, concentration, care, enthusiasm, initiative and dynamism" (1993, p. 136). Belman et al., (1992) concur that effort is better thought of as a vector than a scalar and focus on three defining aspects of effort: (i) it produces disutility; (ii) it is hidden from the firm; (iii) it is relevant to individuals and not workgroups. In a paper on union bargaining, Andrews and Simmons (1993) offer an extremely broad definition of effort which, as well as the pace and intensity of work, includes such things as the generosity of coffee breaks in a workplace, the extent of paid holidays, the amount of union input into production decisions and so on. They summarise their definition as "anything that is bargained over in real-world negotiations, apart from employment and wages, and is not paid for directly" (p. 315).

It is not surprising that, in the absence of a single, generally accepted definition of effort, empirical investigators have operationalised the idea in a number of different

ways. Wadhwani and Wall (1991) and Machin and Manning (1992) use the residual from a production function estimated on firm-level data as a measure of worker effort. Treble (1998) measures changes in output per worker resulting from a natural experiment involving mine workers in Victorian England. Agell (1994) uses time diaries kept by workers to calculate the proportion of time spent at work in which the workers are actually working as opposed to conducting personal business or searching for new jobs. Cappeli and Chauvin (1991) measure shirking (the opposite of effort) by the rate of disciplinary dismissals in a number of plants owned by a large U.S. manufacturing company.

An alternative approach argues that if we believe that there is general acceptance of what effort actually is, then a useful way of proceeding is to ask people how much effort is exerted by themselves or others. Examples of this subjective approach, which we follow, include Fairris and Alston (1994) who use respondents' answers to a survey question on whether they work "hard" and Drago and Heywood (1992) who use responses to a question on the physical and mental effort required by the job. Green and McIntosh (1998) use an effort variable derived from a question in a survey of UK establishments which was asked of workers' representatives about the pace or intensity of manual work in their plant relative to other similar establishments. Belman et al., (1992) adopt a so-called "dobbing" approach whereby a worker's colleagues were asked to assess that worker's level of effort along a number of dimensions by responding to questions about a range of shirking behaviours in which the worker might engage.

The use of a subjective measure of worker effort neatly sidesteps the definitional problems outlined above. If we can assume that people "know it when they see it" then why not just ask them how much effort they put into their work? Of course, the approach may introduce potential difficulties of its own and we discuss some of these in our description of the data in section IV. It is worth noting that subjective, self-reported measures have formed the basis of empirical investigation in a variety of areas of economics. This body of work includes, for example, the analysis of happiness by Oswald (1997), job satisfaction by Clark (1996) and firm financial performance by Machin and Stewart (1990). A cautionary note on the use of

subjective psychological assessments is sounded in the work of Kahneman (e.g. Schkade and Kahneman, 1998; Fox and Kahneman, 1992)

II. MODELS OF EFFORT

Theoretical models of effort determination customarily begin from the idea that workers enjoy the consumption of goods and services which the earning of a wage allows but dislike the exertion of additional effort in any hour of work. Workers will trade off wages and effort along indifference curves which slope upwards in wage-effort space. The models of effort outlined in this section can be thought of as relating to the shape of these indifference curves or to determination of the point on a particular indifference curve chosen by the worker.

Other things equal, firms would prefer workers to exert more effort and this can be viewed as an agency problem. In an uncertain world where output levels are subject to random influences and there is asymmetric information such that principals (firms) cannot fully observe the effort of agents (workers), incentive compatible contracts offering wages which are contingent on states of nature can provide an optimal second-best solution to the problem (Grossman and Hart, 1983). Effort levels will depend on the degree of asymmetric information, the level of uncertainty and the nature of any risk-sharing contracts which contain incentive payments. The principal-agent approach also emphasises the role of monitoring in the measurement of worker effort. Where the firm can observe a signal which is correlated with effort, the additional incentives associated with good states of nature can be lower while still satisfying the constraint of incentive compatibility. Thus, in the standard principal-agent model, shirking is more likely where monitoring is reduced. Cowen and Glazer (1996) and Frey (1993), however, present modifications of the principal-agent model in which more monitoring can actually reduce effort.

Variants of the efficiency wage model also emphasise the compensation that must be provided to workers in exchange for higher levels of effort. While such models also incorporate the idea of imperfect observability of effort, uncertainty related to output is less important. Instead, a relationship between output and wages is assumed which implies, via the Solow condition, that the profit-maximising firm will set a wage rate

which is higher than the competitive level. The precise reason for the dependence of output on wages distinguishes different types of efficiency wage model. The two versions of the model which explicitly incorporate a discussion of effort levels are the shirking model of Shapiro and Stiglitz (1984) and the fair-wage effort model of Akerlof and Yellen (1990).

In the former approach a relationship between wages and effort levels arises through the "no-shirking condition" - an inequality which asserts that the equilibrium (efficiency) wage paid by firms will be positively related to the difficulty with which a worker's activity can be supervised or monitored and the extent of the opportunities available to the worker outside the firm. Thus, for given wages, the worker is more likely to shirk where there are obstacles to close supervision and where the penalties for supplying low effort levels are less severe. In turn, these penalties will be greater where the worker is more likely to be dismissed for shirking and where dismissal implies a lower income flow.

In the work of Akerlof and Yellen (1990) the worker and firm are motivated by concerns for fairness and act in a manner which is described as an "exchange of gifts". The worker provides additional effort to the firm in exchange for a wage above the market-clearing level. Reciprocal motivations for fairness in individual utility functions underpin such behaviour; recent work has suggested that these motivations may be important in a variety of economic settings (Fehr and Gächter, 1998).

Effort levels and the relationship between effort and wages have also been the focus of models of union bargaining behaviour. In Andrews and Simmons (1995), unlike the shirking or principal-agent approaches, effort is observable to the firm and to the worker and can thus form the basis of an explicit contractual arrangement. Increases in union power are generally expected to reduce effort levels although the effects on wages and employment are ambiguous (Bulkley and Myles, 1997). On the other hand, Freeman and Medoff's (1986) 'exit-voice' approach to the economics of trade unions suggests that collective voice can improve worker morale and productivity, presumably through improved worker effort.

The theories outlined above can be characterised as attempts to explain how workers arrive at a particular point on their indifference map in wage-effort space. The constraints on the workers which prevent them from reaching ever higher indifference curves are the external labour market conditions and the behaviour of the firm. We should also note, however, that for given constraints the shape of the indifference map will influence the effort level that a worker chooses. At any wage-effort combination, the marginal rate of substitution between effort and wages will vary between workers who are otherwise identical. An individual's marginal disutility of effort is therefore a potential determinant of the effort levels that we observe. There is relatively little discussion of this type of effect in economics as preferences are usually assumed as given and difficult to observe. Our data provide a proxy for labour/leisure preferences or the idea of a "work ethic" (Furnham, 1990; Buchanan, 1991).

The preceding brief review of the theoretical literature pertaining to effort suggests that a number of perspectives need to be addressed and that no single framework can explain the effort outcomes that we observe in a cross-section of workers from a variety of occupations and industries. Consequently, it is important to control for all of the relevant factors. Our model of effort includes variables relating to each of the following: (i) hourly wage rates and other aspects of remuneration; (ii) monitoring and supervision; (iii) unemployment; (iv) unionisation and (v) attitudes to work.

It is also clear that in many economic models of effort the wage and the chosen degree of work intensity are simultaneously determined. In our effort equation we need to control not only for the level of the wage but to account for the fact that this is likely to be an endogenous variable. We therefore estimate an augmented human capital wage equation to provide an instrumental variables estimator of the parameters of the model.

III. DATA

The EIB study surveyed the British labour market in April and May 1992. Postcode information was used to generate a nationally representative sample of employed and self-employed people aged between 20 and 60. A total of 3855 respondents were interviewed. Questions were asked on a wide variety of issues relating to the

respondent's current employment position, employment history and to the characteristics of their employer, where appropriate. In addition, respondents were asked a set of questions designed to elicit subjective preferences and attitudes to a wide variety of aspects of employment. A detailed sociological analysis of the data and further details of the sampling methodology are found in Gallie *et al*. (1998).

To reflect the potentially multidimensional nature of effort we use data from two different questions relating to employees' self-reported work intensity. The first question was directly asked to respondents by interviewers:

Q1 How much effort do you put into your job beyond what is required?

Respondents were invited to categorise their answer according to the following four options:

1 None
2 Only a little
3 Some
4 A lot
8 Don't know

The second question was asked in a self-completion questionnaire that respondents addressed after the interviewer had administered the main survey instrument:

Q2 Compared with others how much work do you do?

1 Much less
2 Somewhat less
3 Same
4 Somewhat more
5 Much more
8 Don't know

Whether or not the estimates presented in this paper are informative depends on the extent to which these variables accurately reflect dimensions of the individual's work intensity. We can never know this for sure; without the mind-reading technology of science-fiction it is not possible to directly observe how diligently an individual is applying effort to a task. Instead we can infer something about effort from the individual's behaviour, from the efficacy with which the task is carried out or we can ask that individual directly for their assessment of how much effort they are applying. There is much to commend the direct approach. Inference based on the observation of an individual's effort by another (e.g. asking a supervisor or the "dobbing" approach) risks contaminating the observation due to the intervention of the observer. The effort exerted by a worker when the supervisor is present may not accurately reflect their underlying behaviour and interpersonal relations may colour the judgement of colleagues. Similarly inference based on measuring how well the task is completed, as in approaches which use output measures to assess worker effort, requires that all other potential influences on the indicator variable have been controlled for. Control failure risks ascribing to effort productivity differences which have their origin elsewhere.

While the wording differs, the indicators of effort available to us directly ask workers to assess how hard they work. Q1 has the potential advantage of explicitly using the term "effort". If it is true that people have a shared conception of what this term means, if they "know it when they see it" (or exert it), then such a self-assessed measure will be appropriate. In this way, effort is similar to the concepts of satisfaction or happiness which have been studied in economics. Q1 also asks individuals to rank their effort relative to a baseline, namely the amount required for the job. This is reasonably unambiguous; presumably people will interpret it to mean how much effort they exert beyond a minimum level, below which the job would not get done or below which their performance would be deemed to be unsatisfactory.

Q2 embodies a more quantitative interpretation of effort. Given the discussion of the multidimensional nature of effort, this may be a disadvantage. Getting more work done does not necessarily imply that more effort has been put in. The examiner who invites the jealousy of his colleagues by grading 20 exams in an hour while others have graded only ten may be doing the precise opposite of exerting more effort. In

other words, the qualitative aspects of effort may be as important as the quantitative. On the other hand, there may be certain routine tasks, and by extension jobs, in which the number of items processed is a good indicator of the effort put in.

Panel (a) of Table 1 displays the reported effort levels using Q1 for a sample of full-time workers in paid employment. The modal category was to report a lot more effort than required for the job and only 3% of the workers admitted to putting in the bare minimum level of effort. It is possible to question the plausibility of this. Perhaps workers overstate their level of work commitment in order to enhance their own feelings of wellbeing or to gain favour in the eyes of the interviewer. On the other hand, in the modern labour market where, in many occupations, the importance of job performance for promotion and advancement is emphasised, it may be true that the majority of workers strive to exceed the minimum effort requirement of their employment.

[Table 1 here]

The answers to Q2 are contained in panel (b) of Table 1. In this question workers were asked to rate themselves relative to "others". The modal category was "the same" - most workers were unable or unwilling to differentiate themselves from "others" on the basis of how much work they did. Of those who did, there was a clear tendency to report doing more work than others. Universally this cannot be true which suggests possible reporting bias in the direction of overstating effort. Nevertheless the question on how much work people do may capture dimensions of effort not picked up by the other measure.

It would be desirable to compare the frequency of the responses to the two questions to findings from other data sets and contexts. Unfortunately the sparse data on self-reported effort levels come from questions which are far from standardised. One shred of evidence gleaned from Fairris and Alston (1994) is that 68% of their sample agreed or strongly agreed with the statement that "My job requires that I work very hard".

A final point worth making from Table 1 is that despite the alleged amorphousness of the concept of effort, judging by the response rate to Q1, very few of the respondents had difficulties in understanding the question or providing an answer. Indeed there was a substantially higher non-response rate to Q2 and to other questions in the survey. While it may be difficult for economists to summarise the dimensions of effort in a single mathematical variable, or to provide an exhaustive list of all its components, it seems that asking people to assess their own levels does not present them with too onerous a task.

An advantage of the EIB data set is that it contains a number of variables which provide useful, and not commonly available, information on the potential determinants of work commitment or effort. Respondents to the survey were asked to report on a number of dimensions of the extent of supervision that they were subject to in the workplace. We use information on (i) how easy the worker thought it was for their supervisor to know how much work they were doing, (ii) how easy it was for their supervisor to know the quality of their work, (iii) how quickly they would be dismissed for persistently not working hard. The former two reflect the ease of supervision, which is presumably related to the firm's investment in monitoring technology, and determine the potential for shirking while the latter measures the penalties for aspects of shirking in terms of how real the threat of dismissal is perceived to be. As in the discussion of the effort variables it is possible to question the accuracy of self-reported information of this kind compared to "objective" measures of the number of supervisory to non-supervisory employees or characteristics of the production process. However the questions asked can be defended on the grounds that it is precisely the perceptions of how easy it is to shirk and the penalties for doing so that are important to the worker's decision making.

[Table 2 here]

We also take advantage of some of the attitudinal variables in the survey to capture ideas of preferences over work and leisure, attitudes and values relating to the firm and the workers' subjective assessments of various aspects of employee-management relations. Tables 2 and 3 contain some descriptive statistics which correlate the effort measures with a range of other indicators. The broad message which emerges from

the tables is that there is considerable variation in how the different indicators are correlated with a range of other variables. There are some consistencies across the indicators. Women, for example, report higher levels of work commitment than men and the same is true of public sector workers compared to private sector workers. Effort and work quantity exhibit a positive association with educational attainment but a negative association with unionisation.

[Table 3 here]

As Table 3 demonstrates, the additional effort measure and work quantity measure are highly and significantly correlated and are also correlated with a measure of lateness which we might think of as yet another dimension of (negative) work commitment. The other correlations in Table 3 illustrate the potential importance of values and management-worker relations in generating additional effort. Generally speaking, the work quantity measure displayed fewer significant correlations with the other variables than the additional effort measure.

IV. ECONOMETRIC METHODOLOGY

The effort indicators are analysed within a latent variable framework. Define y_i^* to be an underlying index of work effort. We observe a categorical variable y_i which takes an integer value depending on the level of the index function

$$y_i^* = \boldsymbol{\beta}\mathbf{x}_i + u_i \qquad i = 1, \ldots, n \qquad (1)$$

where $\boldsymbol{\beta}$ is a vector of parameters, $\mathbf{x}_i$ is a vector of observations of a set of explanatory variables for worker i and u is a random error term. Assuming that u is independently normally distributed leads to the ordered probit model:

$\Pr(y_i = 1) = \Phi(c_1 - \boldsymbol{\beta}\mathbf{x}_i)$,

$\Pr(y_i = 2) = \Phi(c_2 - \boldsymbol{\beta}\mathbf{x}_i) - \Phi(c_1 - \boldsymbol{\beta}\mathbf{x}_i)$

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$$\Pr(y_i = J) = 1-\Phi(c_{J-1} - \boldsymbol{\beta}\mathbf{x}_i)$$

where Φ is the standard normal cumulative distribution function and the c's are auxiliary parameters to be estimated.

This assumes that the elements of **x** are exogenous in the sense of being uncorrelated with the error term. We have argued that this is implausible with respect to the wage variable since wages and effort levels are likely to be simultaneously determined. Hence we use an instrumental variables estimator by adapting the two-step procedure of Heckman (1978) and Amemiya (1978) to the case where the dependent variable is ordinal. This involves the estimation of a reduced form earnings function:

$$w_i = \gamma_1 \mathbf{z_i} + v_i \qquad i = 1, \ldots, n \qquad (2)$$

where w is log hourly wages, **z** is a vector of exogenous variables which includes the exogenous variables in **x** and v is a random error which is assumed to be jointly normally distributed with u. The fitted value of w is then included as a regressor in (1) to obtain a consistent estimate of the effect of wages on effort. We also correct the variance covariance matrix to take account of the fact that an estimated value has been included as a regressor.

To ensure that the parameters of interest are identified it is necessary that some exogenous variables in **z** are excluded from **x**. In our application, to capture the effects of the theoretical determinants of effort discussed in section III, the vector **x** included variables relating to the nature of supervision and monitoring in the firm, the unemployment rate in the local travel to work area, the extent of unionisation in the firm, attitudes to work and controls for gender, industry and sector. In addition, the vector **z** contained: (i) age, its square and the worker's highest educational qualification to proxy human capital; (ii) measures of workplace conditions to control for compensating payments; (iii) a race dummy to capture discrimination; (iv) firm size controls and (v) a dummy variable for whether the worker was responsible for supervising others. Descriptive statistics for the explanatory variables are contained

in Table A1 in the Appendix while estimates of the reduced form wage equation are contained in Table A2.

V. RESULTS

Table 4 presents the estimated coefficients from the effort equation. For each of the effort indicator variables, two specifications are reported. In the first, the log hourly wage was entered directly as a regressor. In the second specification, fitted log wages computed from the estimates of equation (2) are included in place of the actual log wage. The sample is full-time male and female workers in paid-employment.

[Table 4 here]

We consider first the estimates of the equation in which the dependent variable derives from the question which directly asks about "effort" (Q1). Where we do not instrument for wages the log of the hourly wage rate is positively but not significantly related to effort. However when we include the instrumented variable the coefficient increases and becomes highly significant. A positive wage effect is consistent with a variety of models of effort including versions of the shirking model, the fair wage effort hypothesis and the principal-agent approach. Of itself it does not allow us to distinguish between any of these approaches. As additional evidence we look at the impact of performance-related pay and perceptions of fairness.

We included as a regressor a dummy variable indicating whether the worker's remuneration contained an element of performance-related pay. Other authors report mixed evidence on how such remuneration schemes affect workers. Lazear (1996), using data from an autoglass firm in the US, shows that the introduction of performance pay resulted in productivity increases of up to 36% of output. Conversely, Marsden and Richardson (1992), looking at public sector workers in the UK, concluded that there were only "modest" effects on worker motivation. In our sample from a cross section of British workplaces we found a positive and statistically significant coefficient on the dummy variable suggesting that effort levels are higher where there is a performance-related element to workers' pay.

A major plank of the fair wage variant of the efficiency wage model is that workers' perceptions of the justice or otherwise of the pay that they receive influence the supply of effort . In the survey, workers were asked to rate the fairness of their pay. Unfortunately the relevant questions exhibited high rates of non-response and the resulting small sample sizes make it difficult to incorporate these variables into the regression analysis. Instead, Table 5 reports the results of correlating the responses to the questions on the fairness of pay with the effort indicator variables. While our findings should be qualified by the small sample size and the lack of other control variables, there is no evidence that perceptions of fairness do affect effort levels in the expected direction.

[Table 5 here]

In addition to the impact of remuneration in motivating workers the extent of monitoring or supervision is predicted to affect the effort supplied by workers by altering the tradeoff between wages and effort. However, in neither of the specifications is there any evidence that (workers' perceptions of) the ease with which work is supervised has any impact on the effort levels that they report. This applies equally well to supervision regarding the quality of their work or the amount of work that they do. This is a surprising finding which contradicts a basic prediction of the efficiency wage and principal-agent approaches.

Further investigation of the variables which reflect the ease of supervision suggests that around 40% of the sample on which the equation was estimated reported that it was "very easy" for their supervisor to know either the quantity or quality of their work while 10% or less reported that it was "very hard". This would appear to give enough variation in the explanatory variables for us to detect any effect which was there. An potential alternative explanation for the finding comes from the work of Frey (1993) who argues that excessive monitoring can reduce "trust" in the workplace by breaching an implicit psychological contract between workers and their superiors. The morale-reducing effects of this diminish productivity. Frey reports supportive evidence where the impact of monitoring on effort was examined in firms where an impersonal relationship existed between workers and superiors compared with firms in which this relationship was more personal. The relationship between monitoring

and effort was positive in the former group of firms but negative in the latter. Unfortunately the measure of effort used was the number of hours worked rather than work intensity within any hour.

The EIB data set contains no direct measure of workers' perceptions of how trusted they feel. There is, however, a question on perceptions of the quality of the relations between management and employees. It can be argued that this variable is correlated with the health or otherwise of the psychological contract between workers and their superiors. We correlated this attitudinal variable with the supervision variables and found a Spearman rank correlation coefficient which was positive and statistically significant for each of the quality and quantity aspects of supervision. Given the coding of the variables this implies that where supervision is harder relations between workers and management are worse - the opposite of what Frey's argument would suggest. We also augmented the effort function with dummy variables reflecting perceptions of management-worker relations to see whether this affected the estimated coefficients on the supervision variables. While effort was significantly increasing in good management-employee relations, the ease of supervision still did not influence the level of effort.

As a final word on supervision, it is worth noting that our data provide some direct evidence on the link between firm size and supervision. There is a large literature which argues that firm-size wage differentials can be explained by the difficulties of monitoring performance in large firms. Indeed previous empirical work on efficiency wages has often argued that firm size can be used as a proxy for how closely a worker will be supervised. Polachek and Siebert for example claim that "in large firms … the 'arms length' relationship between management and workers prevents managers accurately assessing worker performance." (1993, p. 261). The EIB data allow us to examine directly whether firm size has any impact on whether workers perceive that they can be more easily supervised or not. The firm size indicator variable is ordinal running from firms in which the worker is alone (coded 1) to firms with over 500 employees (coded 6). The Spearman rank correlation coefficient between firm size and ease of supervision of work quantity (quality) was 0.03 (0.03) with a p-value in a two-tailed test of independence of 0.16 (0.09). The argument that larger firms pay

more because of the difficulty of supervision does not receive strong support from these data.

Of course, the ease of supervision is only one element of the disciplinary and monitoring environment in a firm. How difficult it is to observe whether workers shirk or not may only affect the behaviour of those workers if there are consequences as a result of being observed. Models of shirking and effort tend to assume that there is some sanction that the firm can impose if a worker is caught supplying low amounts of effort. In the efficiency wage model, this sanction is usually dismissal. However, dismissing a worker may be costly. There are redundancy payments and other firing costs, the loss of firm-specific human capital that the worker embodies, the implications for industrial relations within the workplace, the prospect of litigation or legal redress on the part of the worker and so on. These quasi-fixed elements of labour costs imply that the link between shirking and dismissal may not be as direct as simple theoretical models presume.

The EIB survey asked workers to assess how long it would take for them to be dismissed as a result of persistent lateness or persistent shirking and this was included as an explanatory variable in the effort function in Table 4. The perception of ease of dismissal was a significant predictor of self-reported effort levels; those who believed that persistently not working hard would have more immediate repercussions were more likely to report that they supplied additional amounts of effort. It is clear that the workers' perceptions will reflect the contractual arrangements of their employment and those on casual or temporary contracts may be the ones who recognise the impermanence of their tenure. The results suggest that the "flexibilisation" of labour markets, insofar as this is interpreted as implying a lower use of permanent contractual arrangements, may have an impact on the firm at the intensive margin of work effort within any hour as well as at the margins of employment and hours of work. Moreover, this aspect of the employment relationship would appear to be more important than the direct impact of the level of supervision or monitoring imposed on workers.

Having discussed the impact of pay and supervision in determining effort, we turn to consider another element of the shirking model - unemployment. There was no

evidence from the effort function that the unemployment rate in the worker's travel to work area had any impact on effort levels. Theory emphasises the importance of unemployment as a threat the worker faces if they do not supply sufficient effort but we find no direct effect of this on the level of effort reported by the workers in our sample. One possible explanation is the macroeconomic situation at the time when the interviews were undertaken. Perhaps unemployment was too low to be seen as a threat by workers. In April and May of 1992 the labour market was characterised by relatively low but rising unemployment but there was considerable variation in unemployment rates across travel to work areas in the data - the in-sample unemployment rate varied between 3.5% and 15.0%. The lack of an unemployment effect using these micro level data contrasts with findings from other authors who have used a variety of alternative measures and methods. Agell (1994) and Belman et al. (1992) use subjective measures of the likelihood of job loss and find that the greater is this likelihood then the lower is the level of shirking. A potential explanation for our finding is therefore that the local unemployment rate is a poor proxy for any individual's subjective assessment of the probability of them finding themselves out of work and it is this latter measure which is important in affecting worker motivation. At the level of the firm, Huang et al (1998) and Wadhwani and Wall (1991) report that higher unemployment rates increase the unexplained component of productivity in a panel of firms. This is interpreted as consistent with the shirking model. Agell and Lundborg (1999) also report that unemployment is a direct motivator of the workforce. In a panel of 170 firms sampled in a time of low unemployment and then again in a time of high unemployment, they found that managers assessed their workforces to be working harder and shirking less when unemployment was higher. The variety of measures of effort and unemployment in these various studies precludes direct comparison with our own results nonetheless the lack of a link between local unemployment and effort in our data has no obvious explanation and requires further investigation.

The effects mentioned thus far were consistent across the two specifications of the effort equation which used the responses to Q1. This is also true of the impact of union membership. Those who belonged to unions or who worked in firms where there was a union presence were less likely to report supplying additional effort. This coheres with the predictions of standard models of union bargaining in which unions

act to increase wages and reduce the effort supplied by workers. It is interesting that presence and membership have separate effects on the probability of supplying higher effort. One can imagine that, where a union is present, it may bargain with firms over working conditions and secure a less intense working environment for all workers. Members may feel an additional degree of protection from management attempts to increase intensity since they can invoke the protection of the union.

The attitudinal variables relating to the individual's view of the importance of work turn out to be highly correlated with work effort. Those who agreed the most with the statement that "hard work is fulfilling in itself" were most likely to report that they provided a greater amount of effort than required. We interpret this variable as representing individual preferences for labour over leisure where, in the current context, the leisure in question is taken on the job. The importance of such attitudinal factors in explaining effort choices is something that is easily overlooked by economists since preferences are not usually observed. Our results suggest that variation in preferences can be at least as important in explaining effort differentials between individual workers as the factors normally studied and measured in economics.

Turning to the remaining controls in the effort equation we find that, other things equal, there was no additional role for sector (public or private) or broad industry classification (manufacturing or services). Concerning gender, in spite of being paid more than females, males reported that they supplied less effort. This may reflect physical or psychological differences between the sexes. Blanchflower and Oswald (2000) and Oswald (1997) find that women are persistently more likely to report that they are happy in surveys designed to measure life satisfaction or wellbeing and it may be that our findings reflect a similar underlying gender difference in perceptions of effort. On the other hand, the gender dummy variable may be detecting unmodelled differences in the types of employment carried out by males and females.

We now briefly consider the versions of the model which used the "much work" specification of the dependent variable derived from Q2. Far fewer of the explanatory variables have coefficients which are significantly different from zero. There is some evidence that unionisation reduces effort as before and that attitudes to work are

important. The only other significant coefficient is on the variable reflecting that the supervision of work quantity is very hard and here the effect is counterintuitive. In terms of interpretability, these results are somewhat disappointing and suggest that the quantitative definition of effort offered by Q2 is fundamentally different to that derived from Q1.

VI. CONCLUSIONS

In economics, empirical work is a dialogue with the data rather than an interrogation and our empirical investigation of self-reported effort levels was motivated not only by an interest in uncovering what determines workers' work commitment or intensity, but also by the question of how that commitment or intensity ought to be measured. We therefore analysed the responses to two questions and the results suggest that asking people directly about their additional work effort beyond some minimum yields answers which can be readily interpreted and sensibly related to other economic and attitudinal variables. That is not to say that the subjective approach to measuring effort is unproblematical. We found that asking people how much work they did relative to others did not provide such useful answers and it would appear that the quantitative nature and interpersonal focus of the second question prevent it from capturing important aspects of what we mean by work effort. It would also be inappropriate to conclude that other approaches to measuring effort are inferior to using self-assessments. None of our results say anything about the actual productivity of the respondents' firms; there is no possibility of knowing how an individual's assessment of how hard she is working feeds through to the production function of her employer. Nevertheless, the findings were sufficiently strong to suggest that the subjective approach offers an alternative and complementary method of measuring worker effort.

Our investigation of the determinants of effort was motivated with reference to a number of theoretical models. In line with theories of efficiency wages and principal-agent models, we found that pay was related to effort levels. Specifically, when account was taken of the simultaneous determination of pay and effort, we found that effort was an increasing function of the hourly wage. Where pay contained a performance-related component, workers also reported working harder. In a sense

this is unsurprising; where effort has a negative marginal utility, workers will have to be bribed to endure more of it. Equally it would be barely credible that so many firms would adopt performance-related pay if it did not yield them some benefit. Adam Smith's view that "Where wages are high … we shall always find the workmen more active, diligent, and expeditious than where they are low…" (1776, p. 184) receives some support from the EIB data.

Of the other variables which theory suggests are important, it was somewhat surprising to find that neither the level of supervision, as proxied by workers' perceptions, nor the local unemployment rate were related to effort levels. Rather, what mattered was the ease with which workers could be dismissed. This is a neglected aspect of the supervisory and monitoring process which our results suggest should be paid more attention. Theory tends to assume that dismissal is instantaneous; in the real world the quasi-fixed nature of the factor labour can have important implications.

Trade unions were associated with reduced effort levels, a finding which is consistent with Green and McIntosh (1998), who use UK data from the Workplace Industrial Relations Survey. They argue that unions reduce the impact of external labour market forces on workers' effort levels. McIntosh and Green (2000) further argue that the general pattern of increases in work intensity across Europe can be explained by the interaction of the introduction of new technology with declining trade union power. One might be tempted to conclude from this that enhanced communication between firms and workers, a role ascribed to unions by Freeman and Medoff (1986) is not important in improving productivity. However, as our discussion of the variables relating to the quality of relations between management and employees indicated, where relations are perceived to be healthy, workers supply more effort. It may simply be that in a world of declining unionisation, alternative channels are used to facilitate communication and presumably to improve relations.

This brings us to the importance of attitudinal variables. Perceptions of management employee relations appear to be important but are typically not modelled within standard economic theory. Attitudes to work, on the other hand, have a ready interpretation in terms of labour-leisure preferences and the marginal disutility of

effort. We have argued that responses to the statement that "hard work is fulfilling in itself" are directly correlated with self-reported effort levels. While we would not wish to overstate the case, the apparent explanatory power of such variables suggests that, as well as the usual suspects, economists may wish to pay some attention to preferences and their formation when seeking to explain work effort.

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Table 1 Response Frequencies - Effort Questions

(a) Effort (Q1)

	Frequency	Percent	Cumulative
none	82	3.01	3.01
little	155	5.69	8.70
some	618	22.70	31.40
a lot	1853	68.05	99.45
missing	15	0.55	100.00
Total	2723	100.00	

(b) How Much Work (Q2)

	Freq.	Percent	Cumulative
much less	7	0.26	0.26
somewhat less	64	2.35	2.61
same	1378	50.61	53.21
somewhat more	896	32.90	86.12
much more	241	8.85	94.97
missing	137	5.03	100.00
Total	2723	100.00	

Note: Panel (a) tabulates responses to the question “How much effort do you put into your job beyond what is required?” and panel (b) tabulates responses to the question “Compared with others how much work do you do?”.

Table 2 Effort: Means by Other Variables

	Effort (Q1)	How Much Work? (Q2)
Below Median Wages	3.565	3.508
Above Median Earnings	3.568	3.499
Performance Pay	3.652	3.512
No Performance Pay	3.512	3.490
Professional/Managerial	3.685	3.567
Technical/Supervisory	3.590	3.467
Non-Manual	3.574	3.530
Skilled Manual	3.484	3.413
Un/semi-skilled Manual	3.418	3.442
No Qualifications	3.502	3.472
Low Qualifications	3.545	3.471
Intermediate Qualifications	3.562	3.551
High Qualifications	3.654	3.548
Agriculture, Forestry etc.	3.828	3.483
Energy	3.597	3.529
Extraction	3.571	3.635
Engineering	3.489	3.479
Other Manufacturing	3.470	3.449
Construction	3.607	3.354
Distribution/Hotels	3.607	3.540
Transport/Communication	3.314	3.456
Banking and Finance	3.598	3.483
Other Services	3.650	3.537
Broad Manufacturing	3.520	3.477
Broad Services	3.593	3.518
Public Sector	3.573	3.524
Private Sector	3.567	3.491
Union Member	3.501	3.486
Non-Union member	3.623	3.508
Union Present	3.521	3.504
No Union present	3.643	3.505
Below average local unemployment rate	3.613	3.517
Above average local unemployment rate	3.519	3.488
Male	3.522	3.498
Female	3.637	3.510

Note:

For the highest educational qualifications variables, “low” refers to O Levels and equivalent, “intermediate” to A Levels or equivalent and “high” to degree or equivalent.

Table 3 - Spearman Rank Correlations: Effort Variables

Attribute	Effort (Q1)	How Much Work (Q2)
How Much Work (Q2)	0.209	-
	(0.000)	
How often late in last month?	-0.0751	-0.036
(1=never, 6=more than 10 times)	(0.000)	(0.069)
Difficulty of supervision: work quantity	0.016	0.028
(1=very easy, …, 4=very hard)	(0.415)	(0.167)
Difficulty of Supervision: work quality	-0.014	-0.0076
(1=very easy, …, 4=very hard)	(0.475)	(0.709)
Time till dismissal: persistent lateness	-0.021	0.026
(1=within a week,…, 6= never)	(0.315)	(0.216)
Time till dismissal: shirking	-0.054	0.035
(1=within a week,…, 6= never)	(0.009)	(0.098)
Loyalty to firm	0.212	0.062
(1=weak, …, 4=strong)	(0.000)	(0.002)
Similar values to firm	-0.195	-0.029
(1=agree strongly, …, 4=disagree strongly)	(0.000)	(0.157)
Hard work is fulfilling in itself	-0.159	-0.092
(1=agree strongly, …, 5=disagree strongly)	(0.000)	(0.000)
Relations between management and employees	-0.157	-0.018
(1=very good, …, 5=very bad)	(0.000)	(0.366)
Employees influence over decisions	0.117	-0.010
(1=none, …, 5=very much)	(0.000)	(0.622)
How much of a friendly family atmosphere	0.150	-0.000
(1=none, …, 5=very much)	(0.000)	(0.993)
How much care about employees' wellbeing	0.143	0.006
(1=none, …, 5=very much)	(0.000)	(0.745)
People notice when job done well	-0.176	-0.042
(1=agree strongly,…, 4=disagree strongly)	(0.000)	(0.037)

Notes

1. p-values for a test of the null hypothesis of no correlation in parentheses.

Table 4 Effort Regression Results

Variable	Effort (Q1)		Hard work (Q2)	
	Ordered Probit	Two Stage	Ordered Probit	Two Stage
log hourly wages	0.108	0.474	0.059	0.130
	(0.116)	(0.002)	(0.342)	(0.334)
hard work fulfilling:				
agree strongly	0.473	0.490	0.249	0.242
	(0.000)	(0.000)	(0.001)	(0.000)
neither agree nor	-0.260	-0.247	-0.094	-0.113
disagree	(0.004)	(0.003)	(0.269)	(0.153)
disagree somewhat	-0.065	-0.072	0.028	0.020
	(0.631)	(0.560)	(0.823)	(0.860)
disagree strongly	-0.249	-0.134	-0.073	-0.116
	(0.245)	(0.491)	(0.705)	(0.515)
ease of supervision of how much work?				
somewhat easy	0.049	0.020	-0.058	-0.050
	(0.616)	(0.825)	(0.512)	(0.535)
somewhat hard	0.060	-0.037	0.030	0.012
	(0.556)	(0.705)	(0.746)	(0.887)
very hard	0.137	0.039	0.282	0.277
	(0.303)	(0.762)	(0.014)	(0.011)
ease of supervision of work quality				
somewhat easy	-0.111	-0.066	0.005	0.015
	(0.221)	(0.441)	(0.952)	(0.844)
somewhat hard	-0.012	0.073	-.0010	0.007
	(0.908)	(0.476)	(0.919)	(0.937)
very hard	0.135	0.221	-0.076	-0.062
	(0.405)	(0.133)	(0.576)	(0.622)
time to dismissal for shirking:				
within a week	0.261	0.344	0.177	0.218
	(0.180)	(0.043)	(0.243)	(0.108)
within a month	-0.046	0.041	-0.025	-0.027
	(0.643)	(0.660)	(0.775)	(0.738)
within 1 year	-0.226	-0.275	-0.090	-0.093
	(0.023)	(0.003)	(0.319)	(0.268)
more than 1 year	-0.155	-0.234	-0.010	-0.032
	(0.128)	(0.017)	(0.913)	(0.709)
never	-0.263	-0.339	0.125	0.097
	(0.033)	(0.003)	(0.265)	(0.345)
unemployment rate	-0.005	0.004	-0.003	-0.001
	(0.735)	(0.790)	(0.811)	(0.933)
performance pay	0.238	0.186	-0.030	-0.046
	(0.001)	(0.008)	(0.640)	(0.454)
union member	-0.154	-0.203	-0.153	-0.132
	(0.089)	(0.016)	(0.058)	(0.076)
union present	-0.146	-0.162	0.079	0.057
	(0.142)	(0.077)	(0.359)	(0.470)
male	-0.125	-0.182	-0.095	-0.119
	(0.095)	(0.015)	(0.150)	(0.069)
broad manufacturing	-0.015	0.011	0.045	0.045
	(0.853)	(0.881)	(0.519)	(0.480)
public sector	0.090	0.090	0.061	0.042
	(0.280)	(0.238)	(0.415)	(0.531)
Pseudo R^2	0.047	0.050	0.014	0.014
Observations	1444	1368	1427	1355

Notes:
1. The Table reports estimated coefficients and p-values in parentheses.

2. The individual defined by the excluded dummy variables, agreed somewhat that hard work was fulfilling in itself, thought that supervision of their work quantity and work quality was very easy, thought that they would be dismissed within 6 months for persistently not working hard, worked in services in the private sector.

Table 5 - Effort and Perceptions of Fair Pay

	Effort (Q1)	How Much Work (Q2)
Pay fair compared with others in the same	-0.040	-0.0018
firm	(0.152)	(0.949)
(1=much too high, …, 7=much too low).	N=1301	N=1283
Pay fair compared with other firms	0.005	-0.029
(1=much too high, …, 7=much too low).	(0.867)	(0.310)
	N=1280	N=1264
In general paid what deserves	0.028	-0.0553
(1=much more,…, 5=much less).	(0.318)	(0.047)
	N=1302	N=1285
Your pay is fair?	-0.022	-0.032
(1=agree strongly, …, 4=diagree strongly).	(0.439)	(0.260)
	N=1302	N=1284

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Appendix

Table A1 Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
age	36.509	10.408	20	60
no qualifications	0.182	0.386	0	1
low qualifications	0.431	0.495	0	1
intermediate qualifications	0.144	0.351	0	1
high qualifications	0.242	0.428	0	1
nonwhite	0.041	0.199	0	1
work frequently noise	0.252	0.434	0	1
work frequently in bad weather	0.162	0.369	0	1
work frequently in bad temperature	0.355	0.479	0	1
workplace bad for fumes	0.215	0.411	0	1
work frequently painful	0.236	0.425	0	1
work frequently at high speed	0.373	0.484	0	1
frequent heavy lifting	0.232	0.422	0	1
work frequently repetitive	0.342	0.475	0	1
supervisor	0.525	0.500	0	1
1 employee	0.004	0.065	0	1
less than 10 employees	0.086	0.280	0	1
10-24 employees	0.138	0.345	0	1
25-99 employees	0.239	0.426	0	1
100-499 employees	0.270	0.444	0	1
500+ employees	0.263	0.441	0	1
hard work fulfilling: agree strongly	0.233	0.423	0	1
hard work fulfilling: agree somewhat	0.517	0.500	0	1
hard work fulfilling: neither agree nor disagree	0.162	0.369	0	1
hard work fulfilling: disagree somewhat	0.062	0.242	0	1
hard work fulfilling: disagree strongly	0.025	0.156	0	1
ease of supervision: how much work? very easy	0.416	0.493	0	1
ease of supervision: how much work? somewhat easy	0.220	0.414	0	1
ease of supervision: how much work? somewhat hard	0.251	0.434	0	1
ease of supervision: how much work? very hard	0.114	0.317	0	1
ease of supervision: work quality very easy	0.423	0.494	0	1
ease of supervision: work quality	0.308	0.462	0	1

somewhat easy				
ease of supervision: work quality somewhat hard	0.199	0.399	0	1
ease of supervision: work quality very hard	0.070	0.255	0	1
time to dismissal for shirking: within a week	0.045	0.207	0	1
time to dismissal for shirking: within a month	0.186	0.389	0	1
time to dismissal for shirking: within 6 months	0.339	0.473	0	1
time to dismissal for shirking: within 1 year	0.164	0.371	0	1
time to dismissal for shirking: more than 1 year	0.170	0.376	0	1
time to dismissal for shirking: never	0.096	0.294	0	1
unemployment rate	9.458	2.256	3.57	14.93
performance related pay	0.431	0.495	0	1
union member	0.462	0.499	0	1
union present	0.651	0.477	0	1
male	0.636	0.481	0	1
broad manufacturing	0.370	0.483	0	1
public sector	0.367	0.482	0	1

Table A2 Reduced Form Wage Equation

Variable	Coefficient (p-value)
age	0.045
	(0.000)
age squared	-0.001
	(0.000)
no qualifications	-0.145
	(0.000)
intermediate qualifications	0.093
	(0.014)
high qualifications	0.271
	(0.000)
non white	-0.010
	(0.87)
workplace frequently noisy	0.079
	(0.017)
frequently work in bad weather	0.042
	(0.292)
frequently work in bad temperature	-0.061
	(0.059)
workplace bad for fumes	-0.038
	(0.268)
work is frequently painful	-0.049
	(0.146)
frequently work at high speed	0.006
	(0.833)
frequent heavy lifting	-0.059
	(0.083)
work frequently repetitive	-0.056
	(0.058)
supervisor	0.098
	(0.000)
1 employee	-0.282
	(0.102)
less than 10 employees	-0.248
	(0.000)
10-24 employees	-0.125
	(0.003)
25-99 employees	-0.045
	(0.204)
100-499 employees	0.022
	(0.512)
hard work fulfilling: agree strongly	-0.005
	(0.875)
hard work fulfilling: neither agree nor disagree	0.019
	(0.576)
hard work fulfilling: disagree somewhat	0.032
	(0.532)

hard work fulfilling: disagree strongly	-0.075
	(0.353)
ease of supervision: how much work? somewhat easy	-0.006
	(0.868)
ease of supervision: how much work? somewhat hard	0.106
	(0.005)
ease of supervision: how much work? very hard	0.111
	(0.019)
ease of supervision: work quality	-0.009
somewhat easy	(0.777)
ease of supervision: work quality	-0.074
somewhat hard	(0.061)
ease of supervision: work quality	-0.085
very hard	(0.122)
time to dismissal for shirking:	-0.076
within a week	(0.224)
time to dismissal for shirking:	-0.060
within a month	(0.097)
time to dismissal for shirking:	0.106
within 1 year	(0.004)
time to dismissal for shirking:	0.093
more than 1 year	(0.015)
time to dismissal for shirking:	0.143
never	(0.002)
unemployment rate	-0.007
	(0.178)
performance pay	0.100
	(0.000)
union member	0.100
	(0.003)
union present	-0.003
	(0.937)
male	0.192
	(0.000)
broad manufacturing	0.033
	(0.267)
public sector	-0.049
	(0.110)
constant	0.716
	(0.000)
Observations	1373
R-Squared	0.310

Notes:
1. The individual defined by the excluded dummy variables had low qualifications, agreed somewhat that hard work was fulfilling in itself, thought that supervision of their work quantity and work quality was very easy, thought that they would be dismissed within 6 months for persistently not working hard, worked in services in the private sector in a firm with over 500 employees.

2. For the highest educational qualifications dummies, “low” refers to O Levels and equivalent, “intermediate” to A Levels or equivalent and “high” to degree or equivalent.