ECONSTOR
Make Your Publications Visible.

A Service of

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Green, Francis

Working Paper

Why has Work Effort become more intense? Conjectures and Evidence about Effort-Biased Technical Change and other stories

Department of Economics Discussion Paper, No. 0003

Provided in Cooperation with:
University of Kent, School of Economics

Suggested Citation: Green, Francis (2000) : Why has Work Effort become more intense? Conjectures and Evidence about Effort-Biased Technical Change and other stories, Department of Economics Discussion Paper, No. 0003, University of Kent, Department of Economics, Canterbury

This Version is available at:
https://hdl.handle.net/10419/105542

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

ISSN 1466-0814

WHY HAS WORK EFFORT BECOME MORE INTENSE?

CONJECTURES AND EVIDENCE ABOUT EFFORT-BIASED TECHNICAL CHANGE AND OTHER STORIES

Francis Green

May 2000

Abstract

I investigate possible explanations for work intensification, using four British data sets. I conjecture that an important source of work intensification is effort-biased technical change (EBTC), which enhances the productivity of high effort workers relative to that of low effort workers. EBTC can be traced to innovations such as Total Quality Management and to information technology, and is linked with multi-skilling. I argue that EBTC is complementary with skill-biased technological change. Additional sources of intensification are the increasing use of intra-firm communication policies, and the declining power of unions. All the above receive empirical support. However, evidence also shows that neither increased teamworking nor, contrary to popular expectations, changing job insecurity has raised average effort levels.

JEL Classification: J22

Key words: Labour supply, work effort, work intensity.

Acknowledgements: The research for this paper was funded by the Leverhulme Trust. The author thanks Duncan Gallie for assistance in providing data from the Employment In Britain survey. The Skills Survey was funded by the Economic and Social Research Council.

Correspondence Address: Professor Francis Green, Department of Economics, University of Kent at Canterbury, Canterbury CT2 7NP, U.K. Tel: +44 1227 827305; Fax: +44 1227 827784; email: gfg@ukc.ac.uk.

WHY HAS WORK EFFORT BECOME MORE INTENSE? CONJECTURES AND EVIDENCE ABOUT EFFORT-BIASED TECHNICAL CHANGE AND OTHER STORIES

1. Introduction

There is a widespread impression, evident from popular reports and casual empiricism, of an increasing 'tension' and 'strain' across many workplaces in recent decades.[1] In part, the impression of increasing work strain may have come from changing work hours. Although in most industrialised countries average weekly hours of work have come down or, at worst, remained steady since the early 1980s, those hours have been concentrated in fewer households (Gregg and Wadsworth, 1996; Green, 1999). In the United Kingdom the rise in workless households has been strongly linked to benefit rules which favour inactivity when household income is low (Gregg and Wadsworth, 1999). At the same time the proportion of workers putting in over 48 hours has risen. However, just as relevant to the sense of rising strain, there is also now an array of evidence substantiating work intensification in thirteen European Union countries, that is, an increase in the proportion of effective labour performed for each hour of work (European Foundation, 1997; Green, 1999; Green and Mcintosh, 2000).

In this paper, I investigate possible explanations for work intensification. Despite the difficulties of measurement, work effort occupies an important place in both economic and psychological models of the labour contract. Work intensification is likely to have substantive welfare effects (not necessarily negative) on employees. Moreover, changing work intensity figures prominently in critical accounts of productivity change. At the organisation level, for example, downsizing has been seen sometimes as just a "quick fix" for a firm's efficiency

[1] Typical examples are ACTU (1998), Sherwen (1999) and Caulkin (1998).

shortcomings leading only to temporary improvements as surviving employees work harder but become demoralised (deVries and Balazs, 1997). Thus the verdict on downsizing as a managerial strategy is mixed. At the economy level, work intensification is shown to be an ingredient of the productivity boom in U.K. manufacturing, and critics have questioned the sustainability of this mode of growth (Evans *et al*, 1992; O'Mahoney, 1994).

In view of these wider implications, an improved understanding of the causes and sources of work intensification is called for. There is only a little extant research on this issue, not because it is unimportant but because of the scarcity of usable measures of work effort over time. The basic facts about work intensification are clearest in the context of Britain. That the period from the early 1980s until 1997 was one of work intensification has been established using several methodologies:

(i) Overviews of bargaining agreements in several sectors in which workplace concessions, including productivity deals, are prominent (Andrews and Simmons, 1995; Elger, 1990; Tomaney, 1990);

(ii) Case studies of particular organisations (Burchell *et al*, 1999; Edwards and Whitston, 1991);

(iii) Subjective perceptions of recent effort change among survey respondents, either in broadly representative surveys or in specialist surveys of employees in selected organisations or occupations (Edwards *et al*, 1998; Edwards and Whitston, 1991; Burchell *et al*, 1999; Batstone and Gourlay, 1986; IRS, 1996);[2]

(iv) Substantive increases in directly reported subjective effort levels between successive comparable representative surveys during the 1990s (Green, 1999; Green and Mcintosh, 2000);

(v) Large increases from 1986, through 1992 to 1997 in the number of perceived factors pressurising employees to work hard, as revealed in successive comparable surveys (Green, 1999).[3]

---

[2] Such responses display substantive content validity, but may nevertheless reflect respondent biases. Comparison of effort levels in successive representative surveys is a preferable methodology, as in (iv) and (v).

[3] These years are not ideally placed at similar points of the economic cycle. However, the effects of the cycle on work effort are theoretically ambiguous.

Table 1 presents indices that summarise key findings from methods (iv) and (v). The first pair of columns registers 'required effort' for 1992 and 1997. They give the average response to the question "'My job requires that I work very hard'. Do you strongly agree, agree, disagree, or strongly disagree with this statement?", with the responses being scaled from 3 to 0. The second pair of columns records 'discretionary effort', measured by average responses to the question "How much effort do you put into your job beyond what is required?". Responses were coded in the range 1 ("none") to 4 ("a lot"). The third pair of columns records the Work Pressure Sources Index (WPSI). This index is calculated from a question that asks respondents to say "Which, if any, of the things on this card are important in determining how hard you work in your job?" The card included seven possible sources of effort pressure as follows: a machine or assembly line; clients or customers; supervisor or boss; fellow workers or colleagues; one's own discretion; pay incentives; reports and appraisals. Respondents could tick as many effort pressure sources as they wished, including none. The WPSI, which is defined as the number of items checked, is strongly correlated with the other effort measures in 1997; hence I use WPSI as a valid proxy for work effort in the two years.[4]

Table 1 shows that effort has been intensified according to all three indicators. Work intensification has taken place quite broadly across occupations and sectors. However, the increase in effort has been somewhat greater than average for women, for those aged over 40, for service sector and for public sector workers. For men, the change in discretionary effort is

[4] The surveys from which these indices are extracted are the Social Change and Economic Life Initiative survey (SCELI) carried out in 1986, Employment In Britain of 1992 (EIB) and the Skills Survey of 1997. While the latter two were designed to be representative of Britain, SCELI comprises a large sample and is in practice also closely representative on standard socio-economic variables (Green *et al*, 2000a). Full details can be found in Penn *et al* (1994), Gallie *et al* (1998) and Ashton *et al* (1999).

not significantly different from zero. Consistent with previous studies, the level of work effort is greater for women than for men (Bielby and Bielby, 1988; Mcintosh, 1997).

Why has work effort become more intense? Recent studies have attributed work intensification either to increased competitive pressure being passed on to workers (Burchell *et al*, 1999) or to the rising power of bosses relative to declining unions (Green and Mcintosh, 2000). Yet such explanations do not, on their own, sit well with the observation that for the most part work intensification in Europe has been accompanied by rising real wages. If workers have to settle for a smaller share of a lower employment rent, under normal assumptions one would expect intensification to accompany falling wages. Possible further explanations might be gleaned, either from the implicit theorising behind the case studies referred to above or from parallel arguments in the small literature that attempts to explain rising work hours in the United States (Schor, 1991; George, 1997). Effort intensification might come from the supply side, with workers choosing to work harder as their need for income expands or as jobs become more satisfying. Structural changes including the enhanced facility of employers to measure, motivate and discipline effort might also be important. An alternative, appealing, explanation is that the transformation of work processes alongside technical change has been effort-biased. As I show below, there are good reasons to believe that the productivity of high effort workers may have risen relative to that of low effort workers. It is likely that effort-biased technical change is complementary, in many environments, with skill-biased technical change.

All these types of explanations are, at least superficially, potentially valid. The multiplicity of plausible explanations leads me to eschew any encompassing formal labour market model, because these explanations operate in a range of contexts (including perfect competition, bilateral bargaining and efficiency wage models). Rather, I first delineate the explanations using the variety of standard labour market frameworks. These suggest a number

of hypotheses about work intensification that are, to varying degrees, amenable to testing with available data. In the second part, I present the results of testing these hypotheses.

My justification for this strategy is, simply, that a partial understanding of this phenomenon is superior to none. There is insufficient data to allot prime causation to any of these hypotheses with complete confidence, using a full structural model, but it is possible to provide empirical support for certain explanations, while at the same time rejecting others, using British data. To anticipate, I find some significant support for the presence of effort-biased technical change in a representative sample of workplaces, and there are strong indications that such change is complementary with skill-biased technical change. There are also findings in support of the structural change argument, suggesting that the decline of union influence has been a factor, and consistent with posited associations between company human resource policies and worker effort. There is, however, no support for the assertion that increased job insecurity, is causing workers to work harder. Unfortunately, the data do not permit a conclusive analysis of the balance of supply-side and demand-side factors. The changing nature of jobs, or consumerism and the desire for money, could be driving people to supply greater effort, though there is no particular evidence in support.

The paper is organised as follows. Section 2 draws on the economics, industrial relations and management literatures to discuss possible reasons for work intensification, and develops eight hypotheses that can be investigated with available data. Section 3 presents the data and model specification. Findings are discussed in detail in Section 4, and Section 5 concludes by discussing implications for worker welfare.

2. Intensification Hypotheses

2.1. Effort-Biased Technological Change

I conjecture that an important explanation for the intensification of work lies in developments on the demand side of the labour market. On one hand there have been pervasive developments in managerial strategies affecting the way work is organised. On the other the innovation of new information technologies has revolutionised the control of work flows. Complementary changes in human resource policies and workforce skills have reinforced the impact of organisational and technical change.

While these broad developments are widely seen as efficiency-improving, there are good reasons to expect that they are on balance effort-biased, that is to say, they increase the productivity of high effort workers, relative to that of low effort workers. I refer to this process as "effort-biased technological change" (EBTC). In a standard competitive model of effort determination, exogenous EBTC would induce firms to demand more high effort workers, which would in turn bid up the wages of high effort workers.

"Amber Lights" Technology

Recent decades have seen the diffusion of a range of new techniques that generate both new products and more efficient production processes. "Just-In-Time" (JIT) production methods have been followed by "Total Quality Management" (TQM) and other associated work organisation methods, most notably teamworking. Each of these practices had been adopted in at least 7 in 10 UK manufacturing sites by 1996 (Waterson *et al*, 1996). Such techniques have been diffused and adapted through many countries, and across sectors to embrace services as well as manufacturing, and the public as well as the private economy. These techniques have normally been complementary to the expansion of the new information technologies.

A central aspect of JIT and TQM production methods is the achievement of more efficient control of flows of materials and of work. JIT is premised upon the minimisation of inventories, and therefore requires close control of work flows as a direct consequence. TQM's efficiency gains are said to come (in part) through the principle of involving the workforce in delivering continuous quality improvements. An important ingredient of these efficiency improvements is a closer matching of available labour to the required workflow.

The consequence is that it becomes possible to make better productive use of workers who supply high effort. The principle of the systematic removal of buffers is extended to the reduction of idle work time. Whereas, before the innovation of JIT and TQM, there were many gaps in the flow of work, this porosity in the working day starts to be reduced with the new managerial techniques. I call this innovation the "amber lights" method, after a certain Japanese factory which installed a system of lights at workstations on a work flow line (Delbridge *et al*, 1992). While green meant there was time to spare and red stopped the line, amber indicated the worker was bordering on full capacity. The lights were the means for the optimal adjustment of manning levels, amber being the line managers' preferred colour. Critics suggest that, whatever the ostensive purpose behind TQM or JIT, their effect is to extract greater work effort, through a process of 'management by stress' (Oliver, 1991; Sewell and Wilkinson, 1992; Delbridge *et al*, 1992). Although this perspective sees TQM/JIT as an improvement in monitoring technology, it would be a mistake to pigeonhole the effect as a switch to lower shirking in an efficiency-wage framework. Rather, it is evident from the accounts that the chief effect of the improved monitoring is to permit managers to deliver work more efficiently to workers – reducing or eliminating the gaps between episodes of effective work. Yet, work intensification need not be regarded negatively by workers whose time is being more effectively utilised. An alternative view sees TQM as bearing a mix of efficiency gains and work intensification (Edwards *et al*, 1998), and finds that work

intensification is not necessarily disliked by workers if it is accompanied by other changes, such as greater employee involvement, that lend greater job satisfaction (Ichniowski *et al*, 1996; Wilkinson *et al*, 1997).

Expanding information technologies are an indispensable adjunct to the new techniques.[5] Not only have they delivered the technical means for improved co-ordination of materials flows and associated work schedules, they have afforded management an immensely enhanced capacity for the efficient allocation of work. This development is epitomised in the rise of the call centre, the so-called "20th century sweatshop" (Wazir, 1999).[6] Though attention is often given to the ability of call centre managers to monitor and measure employees' outputs with great accuracy, just as important is the automated supply of work tasks – each call following its predecessor with no gaps. However, the key general point about information technology's influence on the production of goods and services which qualifies it for the oft-used epithet of production "revolution", is its pervasiveness among all sectors of the economy.

In addition to heightened workflow via technical co-ordination, the associated communications revolution permits enhanced external effects. The enhancement in productivity of one high effort worker can serve to raise the productivity of other high effort workers with whom he/she is in rapid communication.[7] The classic example, because much complained of, is the e-mail, which offers the possibility of rapid response from high effort correspondents. Reports of executives deluged with voluminous daily e-mail are rife.

---

[5] Complementarities between technical change and certain work reorganisations have been examined both theoretically and empirically (Milgrom and Roberts, 1990; Bresnahan *et al*, 1999; Caroli and Van Reenen (1999).

[6] However, electronic control of work flows predates call centres by some two decades (Barker and Downing, 1980). Moreover, though research confirms high levels of control and attendant high absenteeism and quit rates, workers in call centres do not experience worse job satisfaction or general mental health than other office workers or shop floor manufacturing workers (Holman and Fernie, 2000).

[7] The parallel with endogenous growth-type skill externalities should be clear.

In addition to aiding the filling up of gaps during normal work time, information technology also improves the efficacy of work done outside those hours. It thereby raises the productivity of very high effort workers who take their work away with them. The facilities of laptop computers and globally accessible Internet connections have opened the door to more intensive work on trains, planes and at home. Perhaps unsurprisingly, it is this phenomenon which appears to prompt management writers to comment most frequently on the irony of labour-saving technology failing necessarily to liberate those who labour (e.g. Roach, 1996) - something that Ricardo and Marx discovered in the 19th century.

From the above, I deduce a first pair of hypotheses:

H1: *Since prevalent forms of technical change are effort-biased, work is more likely to have been intensified at workplaces which experienced technical and/or organisational changes than at workplaces where no changes have occurred.*

H2: *Jobs at workplaces using information technology tend to require high effort levels; hence the expansion of IT has intensified average effort.*

The "Washing-Up Syndrome"

The ability of management to induce greater productivity from high effort is further enhanced by the discovery and diffusion of multi-skilling. The discovery has involved an unlearning of the principles of scientific management, coupled with a progressive dismantling of the settlement that accompanied Taylorism, in which trade unions traded acceptance of management's prerogatives in rigidly defined task management in return for rising wages and a measure of job security. It is also likely that the movement towards multi-skilling was enabled by increases in education levels of the work force. Whatever the ultimate source, the development of workers' abilities to perform a range of jobs (sometimes through job rotation or perhaps through training) enables workers to be redeployed as necessary. Workers who can

perform repair and maintenance tasks do not need to await the arrival of specialists when their workplace machines go down, and they can perform routine maintenance at slack times. They can even be redirected to other parts of a factory when demand switches cause bottlenecks elsewhere.

A child that cannot reliably do the washing up after a meal, without braking the plates, is usually excused this domestic chore. In the same way, single-skilled workers, unable to perform other tasks, are likely to experience more pauses than multi-skilled workers are, due to imperfect matching of workflows with available labour. Thus we have:

H3: *The broadening of workers' skills (multi-skilling) has contributed to work intensification.*

Teamworking, Human Resource Management and Effort-Biased Technological Change

An important aspect of organisational change is teamworking, a principle of work organisation that has been widely diffused in industrialised countries over the last two decades. Teamworking appears to be complementary with TQM. The value of teamworking exhibits a balance between productive sharing of information and the free-riding tendency that occurs when individual performance is hard to identify. The choice of teamworking as a form of organisation reflects the trade-off, and is related to such factors as the degree of interdependence of team members' utilities and the design of incentive contracts (Kandel and Lazear, 1992; Itoh, 1991). High effort norms are complementary to teamworking because they facilitate better exploitation of productive co-operation. Also, with the expansion of teamworking comes an enhanced incentive to design teams to have positive impacts on worker effort norms.

More broadly, recent decades have seen the development of techniques aimed at engendering greater identification of employees with company objectives. The new techniques

include human resource methods such as empowerment, mentoring and employee involvement through consultation meetings and other means of intra-firm communication, as well as paternalistic fringe benefits and training geared to engender commitment (Green, 2000). The development of these human resource techniques, where effective, are complementary to teamworking because, as stated above, high effort norms facilitate the high productivity inherent in co-operative working. The development of flexible human resource techniques is also complementary with effort-biased technological change.[8] EBTC has a greater impact on productivity if management is successful in inducing employees to choose to devote higher work effort. Evidence about the efficacy of human resource management is mixed, and it is likely that the effects are contingent on HRM fitting with the organisation (Wood, 1999). Often, attempts to involve workers more come at a time of substantial changes in work organisation and are met with cynicism (Heyes, 1996). Nevertheless, commitment to firms is widely manifest (Gallie *et al*, 1998).

Associated with the techniques for better control of work and materials flows within firms, there is an increasing demand for improved control of flows between companies and by ultimate consumers. Thus, large companies impose strict delivery requirements on contractors, and sometimes insist that their subcontractors deploy similar control techniques. The ability to respond quickly to customer needs is seen as an increasing element of a company's competitiveness (Stalk and Hout, 1990; Cappelli *et al*, 1997). In turn, with workers identifying with the company's objectives, the imperative translates into an acceptance by them of the need to devote sufficient effort to meet the shorter deadlines.

Taken together, these considerations imply:

---

[8] Evidence of the interaction between quality initiatives and the elements of a high involvement management system is given by Macduffie (1995) and by Lawler *et al* (1995).

H4: *Work intensification is also partly associated with the spread of new HRM techniques*. *The impact of teamworking on effort is theoretically ambiguous.*

Effort Biased Technological Change and Upskilling

The factors that generate effort-biased technical change are likely to be associated with upskilling for several reasons. First, new technologies tend to save relatively more unskilled labour, since it is their work which is more easily automated (Bresnahan, 1999). Thus information technology is used both to reduce unskilled labour and to intensify the work of remaining workers. The result is an average upskilling and intensification, even though it is primarily the line workers whose work is being intensified. Second, as we have seen, a prime enabling factor for effort-biased change is the multi-skilling of workers, which is likely to be associated with a more educated workforce. Third, the re-organisation of work more on the basis of teams goes hand in hand with a delayering of management hierarchies, increased devolution of responsibilities and increased discretion over work tasks for a sizeable proportion of the company's workforce. The exercise of discretion requires a certain level of self-motivation, at least in the short term, to ensure compliance with the firm's requirements. At the same time, increased discretion over work methods entails better knowledge of the overall production process, and thus higher levels of skills. Thus high and fairly stringent effort norms are complementary with jobs that entail large amounts of discretion and hence skill.

There is a further sense in which greater motivation is often associated with higher skill, namely through the ambiguities in the notion of skill itself. To the dismay of psychologists and economists, a widespread phenomenon is for employers to see certain employer-favouring attitudes, or qualities such as reliability or honesty, as skills. Reported skill shortages are known to refer frequently to shortages of reliable people who can fit in, rather than to

technically skilled personnel (Oliver and Turton, 1982). Faced with multiple stressors, those who get by are said to have "coping skills".[9] And a sizeable minority of employers who sponsor training do so in order partly to generate enthusiasm for corporate objectives (Felstead *et al*, 1997). In short, if skill is interpreted to include such personal attributes and attitudes, skill-biased change is *ipso facto* also an effort-biased change.

A fourth way in which skill bias is linked to effort bias derives from the proposition that many jobs in the post-Fordist era require a broader knowledge of firms' production processes. Part of this requirement for greater knowledge is likely to stem from increased teamworking, and the influence of TQM methods, which attempt to make everyone responsible for looking for quality improvements. Whatever the cause, this broader scope of many workers' jobs introduces additional non-convexities into jobs, making it costly to split tasks between workers. Thus, to see a project through requires its manager to be fully involved, because to delegate part of it to another worker entails high fixed costs. The increased fixed costs make it optimal to raise the demand for worker effort rather than the demand for more workers.

These arguments suggest a reversal of the traditional association between deskilling and intensification theorised by Braverman (1974), and a further hypothesis:

H5: *Increasingly skilled jobs have entailed greater work effort.*

2.2. Changes in Labour Market Structures

Lean and Mean?

In contrast to my main emphasis on the transformation of the labour process as the chief source of effort intensification, it is changes in labour market structures that have received the widest attention in this respect – primarily, the intensification of product market competition,

[9] I am indebted to Ewart Keep for this delightful term.

the declining power of unions, and associated power shifts in principal-agent relationships at work. The main story, in this framework, is that firms have found themselves under increased pressure to reduce costs and/or raise quality and, with the state's aid in reducing unions' legal powers, have forwarded that pressure onto their workforces. Firms are obliged both to streamline their production processes and to pare their price/cost margins, while shock tactics such as downsizing are deployed to break down traditional effort norms and to reduce payroll costs.[10] In short, it has become the era of "lean and mean" production. Appealing though this story may appear – and there is at least some partial evidence in favour (Andrews and Simmons, 1995; Green and Mcintosh, 2000; Burchell *et al*, 1999) – its main deficiency when applied outside the United States context is that it does not easily explain the stylised fact of increasing wages alongside work intensification.[11] If workers are being more oppressed (losing their share of a falling rent), one might normally expect this to be manifest in greater effort and *lower* wages. So, the intensification of competition and declining union power are insufficient explanations on their own, without an additional element to the story.

Andrews and Simmons' (1995) interesting analysis addresses this issue in respect of early 1980s Britain. They characterise this period as one of increasing competition and declining union power brought on by the early employment legislation in Margaret Thatcher's government. They confirm that, in a conventional bargaining model, these conditions would lead to lower effort and wages. But they also show that there are certain assumptions under which a fall in union power would result in higher effort and higher wages. The needed

---

[10] Studies of downsizing are consistent in assuming that it raises the workload for remaining workers; but they suggest a mixed impact on financial performance, which may be constrained by low morale and impaired efficiency (e.g. Mishra *et al*, 1998; deVries and Balazs, 1997).

[11] Taplin (1996) presents the case of the US apparel industry which in the face of greater competition intensified labour and lowered wages.

assumption is either that unions have a particular utility function (with a positive cross-partial between effort and wages) or, more satisfactorily, that unions' power over effort bargaining is distinct from, and reduced by more than, their power over the wage bargain. They show that the latter story is consistent with changes in productivity, wages, and effort over 1980 to 1984. However, applied to a longer period, the same idea appears far less convincing. Since 1980 union density in Britain has declined steadily, and the union wage differential has fallen (Stewart, 1995; Hildreth, 1999). There seems to be no particular reason to assume that unions' wage bargaining power has held up better, over nearly two decades, than their influence at the workplace. The analysis is best suited to a short period in which production technologies and product market competitiveness are taken as given, while union shopfloor bargaining power is shocked into a weaker stance, as in their model.

Over a longer period, declining union power could have a direct impact on effort through unions being forced to settle for reduced employment rents. A countervailing factor is that unions might raise performance and effort if they provide a more effective voice for workers, as allowed for in Freeman and Medoff (1984). However, unions' decline might also indirectly lead to effort intensification if the waning of their influence reduced the costs of introducing the various effort-biased technical changes discussed above.

In sum, two hypotheses to emerge from the "lean and mean" characterisation of modern industry are:

H6: *An intensification of competition in product markets has reduced employment rents, and consequently raised worker effort.*

H7: *Falling union power and declining density have contributed to the intensification of effort*.

Something To Watch Over Us?

Another part of the intensification story concerns the changes that have occurred in the capacity of employers to monitor conformity with employment contracts. Such changes often constitute additional consequences of the new production and management methods. Thus, the computerisation of workflows, symbolised in the call centre, not only efficiently allocates work tasks, it also monitors their execution and measures work rate with great precision. Similarly, a feature of TQM and JIT is that they raise the "visibility" of work (Sewell and Wilkinson, 1992). Deficiencies in work quality can be more easily traced to individual workstations, with the dual aim of raising efficiency by rooting out poor practices and detecting low effort by individual workers. Improvements in appraisal methods also raise management's ability to monitor performances over a medium-term horizon.

In an efficiency wage model, improved monitoring technology would be predicted to lead to diminished shirking (i.e. greater effort), reduced supervision, lower wages and lower unemployment, or some combination of these (Bowles, 1985; Shapiro and Stiglitz, 1984). In so far as IT is an integral part of improvements in monitoring technology, this argument is further support for *H2*.

Similar predictions arise in efficiency wage models from an exogenous increase in the cost of job loss, brought on by a declining benefit/wage replacement ratio. Many countries, Britain included, have experienced declining replacement ratios over the last two decades. In addition there is evidence that the wage loss on returning to work is substantial in both Britain and the United States and has been increasing in Britain (Nickell *et al*, 1999; Jacobsen *et al*, 1993). The supply of effort may have increased as a result.

With the available data it is impossible to distinguish the effects of improvements in monitoring technology on the risk of job loss from the general impact of market uncertainty.

Nevertheless the predicted relationship of job insecurity to work effort permits the following additional hypothesis:

H8: *Increasing fears of job loss and rising perceived costs of job loss have combined to intensify work effort.*

The above hypothesis is frequently asserted in popular, informal, explanations of work intensification (e.g. London Hazards Centre, 1994).

Information, Effort and Incentive Structures

In addition to the enhanced ability to measure effort for monitoring purposes, firms that deploy TQM and computerised control methods may also benefit by being better able to link effort with pay and retention. By offering appropriate rewards (for example, through Performance Related Pay or effort-related promotion or bonus schemes) employers can expect employees to select themselves according to their willingness to supply higher effort levels. Improved measurability thus permits hitherto infeasible contracts for greater effort in return for more pay.[12,13] This argument provides further support for *H1*. An additional attraction of this argument is that it also predicts both an intensification of effort and a rise in wages, since selecting out low effort/low wage workers will raise both averages.

2.3. The Supply of Effort

It is possible that exogenous shifts on the supply side might have prompted an intensification of work effort. If jobs have become more fulfilling, and less arduous, workers'

---

[12] Ironically, this sequence in which high effort workers are identified and idealised through the prize of high pay is reminiscent of the early days of introducing Taylorism.

[13] Incomplete effort contracts can also lead to "overworking", as distinct from a trend towards higher effort (Rebitzer and Taylor, 1995).

aversion to high effort jobs is reduced, and so they choose higher pay, higher effort jobs than before.[14] In a competitive labour market, firms would respond by offering jobs that require more effort because, at least in the short run, the relative cost of high effort workers is reduced by the excess supply.[15] Some weak, circumstantial, support for such an explanation is available. For example, the increase of non-manual jobs, traditionally thought to embody better working conditions, might be a factor. Gallie *et al* (1998) report an increase in "employment commitment", loosely interpreted as a preference for work. Many of those who work extremely long hours report that they are addicted to their jobs. Nevertheless, against this trend there are no indications of an increase in job satisfaction, which might be predicted by such a shift.[16]

An alternative supply-side explanation for work intensification derives from an economy-wide perspective, in which consumerism, as driven by the imperatives of large corporations, creates an increasing need for consumer goods and services. The craving for more, fuelled by relative income effects, and by the advertising and marketing apparatchiks, is translated into a need for more wages. Thus Schor (1991) explains the long-term increase in average work hours of Americans, who, she argues, are caught on a "work and spend" treadmill. Workers choose to supply more effort, but their choice is constrained and shifted by the increasing wants of the materialist society.

---

[14] This result follows formally from a standard effort model such as Barzel (1973), except effort here is work intensity rather than the length of the working day.

[15] A related possibility is that employers have discovered a way to make work appear more attractive through the redesign of jobs and good human resource practice – such is the view of Ichniowski *et al* (1996). But such an explanation places the source of the shock on the demand side, along with the EBTC explanation.

[16] The proportions of British workers reporting that they are very satisfied or completely satisfied with their job was 39.6 percent in 1989 and 35.5 percent in 1997 (source: International Social Survey Programme, author's calculations).

Assessment of such an explanation is not easy. Whether workers work more to get more income and therefore are able to spend more is hard to distinguish empirically from the opposite chain of causation suggested by Schor, where the pressure to raise spending drives the requirement for more wages. A more complex story is also available in which workers gain rises in income and thence spend more, but after each income rise get locked into the higher spending levels by their changed habits or their long-term debts; in this story, effort levels are ratcheted up along with the materialist wants. There is ample support for the relative income theory in the savings literature. However, there appears to be no obvious reason why consumerism should have taken a greater hold of British workers in recent decades than in earlier times. No such tendency is revealed in consumers' spending decisions – for example, the average propensity to save was approximately 10% in both 1979 and 1997. Thus, though "work and spend" could explain recent work intensification, it remains an *ad hoc* explanation without an additional tale that could rationalise the timing. In this respect, the demand-side explanations discussed above are superior.

A more general empirical assessment of the importance of supply shifts relative to demand shifts might be gleaned from knowledge about the returns to high effort. However, compounding the comparative scarcity of data on effort, much of the return to current effort will be in the form of future pay rises, and promotions, or beneficial job transitions. Returns such as these will not show up in individual earnings functions linked to contemporary effort. There is longitudinal evidence from the British Household Panel Study that working more overtime hours raises the probability of being promoted (Booth and Francesconi, 1997). Working long hours could be thought of as an imperfect proxy for high work intensity. We also know that the dispersion of pay across and within education levels in Britain has widened substantially over the last two decades. However, there is no way of directly confirming that

the rewards to high effort have risen over these decades, since increased pay dispersion also reflects other factors such as skill-biased technical change and institutional transformation.

3. Data and Model Specification

In the next part of this paper I use four British data sets to investigate the above hypotheses. These are the Workplace Industrial Relations Survey of 1990 (WIRS90), for details of which see Millward *et al* (1992), plus the three surveys described in the introduction: SCELI, EIB and the Skills Survey.

Hypothesis *H1* may be addressed directly, using a measure of effort change available in WIRS90, an establishment-based survey. Representatives of the manual workers and of the non-manual workers in each establishment were independently and confidentially interviewed, and asked: "Generally, how does the intensity or the pace of work for most manual (non-manual) workers here compare … with three years ago". Responses were on a 5-point scale ranging from "a lot higher" to "a lot lower". Responses could be biased as a result of socially desirable reactions to the question. However, because the non-manual and manual representatives' responses are positively correlated, both with each other and with estimates of productivity change by themselves and independently by managers and by financial managers, we can have some confidence that the responses do contain useful information (Green, 1999).

To examine *H1* I estimate a simple ordinal probit model of changes in effort, ΔE :

$$\Delta E = \alpha_1 TCOC + \alpha_2 X + u \qquad (1)$$

where *TCOC* is an indicator of technical or organisational change and *X* is a control vector of establishment characteristics.

Other hypotheses are investigated using ordinal probit estimates of effort level determinants:

$$E = \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \nu \quad (2)$$

where E is operationalised by the measures of effort from SCELI, EIB and the Skills Survey described in the introduction, Z_1 is an indicator of the role of computers in the job, Z_2 is a vector of human resource policies applied at the workplace, Z_3 comprises various indicators of the skill used in the job, Z_4 is a measure of union coverage, and Z_5 is a measure of job insecurity. The elements of all RHS variables are described as results are presented, with mean values given in the Appendix.

4. Findings

The findings are presented in Tables 2 to 7. Table 2 gives the estimates from the WIRS90 data (model (1)), while Tables 3 and 4 give estimates (for males and females separately) of the determinants of required and discretionary effort obtained from pooling the EIB and Skills Survey samples. Pooling the samples allows a direct test of whether effort has intensified by reasons of factors other than those controlled for by RHS variables, by including a year dummy. Table 5 expands the list of explanatory variables for required and discretionary effort but in so doing focuses only on 1997 when the expanded list was available. Table 6 examines the determinants of WPSI, derived from pooling the SCELI and Skills Survey samples. Finally, Table 7 analyses directly the complementarity of effort-biased and skill-biased technological change. Tables 3 to 6 contain controls for establishment size, age and hours of work. Although the effort variables are explicitly about work intensity, not hours of work, by including hours I control for any misinterpretation of the effort questions by respondents.

I now proceed to evaluate the validity of the eight hypotheses about work intensification, partly by drawing on existing studies, but mainly by referring to the new evidence shown in the tables.

Technical and Organisational Change

Hitherto, there has been no formal evidence that substantiates the connection between technical or organisational change and effort intensification (*H1*). According to the Employment in Britain survey, 62 per cent of workers experienced an increase in effort compared to their job five years before. Yet, amongst those at workplaces that had introduced automated equipment in the previous two years, 71 per cent reported an increase in effort. Where word processors had been introduced, the proportion with effort intensification was 77 per cent.[17] These significantly different proportions are consistent with an association between computerisation and work intensification. However, with these data the period over which the effort change took place (five years) does not match the period for the technical change (two years), so this evidence is no more than suggestive.

A more adequate test of *H1* can be obtained from WIRS90. Managers were asked: "During the past 3 years have there been here any of the following types of change, directly affecting the jobs or working practices of any section or sections of the manual/non-manual workforce: (a) … the introduction of new plant, machinery or equipment (excluding routine replacement)?; (b) … substantial changes in work organisation or working practices not involving new plant, machinery or equipment?".[18] There is a substantial association between these indicators of technical or organisational change and the effort change independently

[17] I am indebted to Duncan Gallie for kindly providing me with the figures in this paragraph.
[18] These questions were only asked of manual (non-manual) workers where there were at least 25 manual (non-manual) workers in the establishment.

reported by workers' representatives. Table 2a gives the proportions of workers reporting that effort was "a lot higher", according to whether there had been organisational or technical change. Among establishments with no changes for manual workers, just 22 per cent experience "a lot higher" work effort, compared to 36 per cent where there is either some technical or some organisational change. Among non-manual workers, 33 per cent report a lot higher effort when there are no changes, compared to 49 per cent when there is technical or organisational change.

A formal test of *H1* is made by estimating the impact of organisational or technical change on effort change in a multivariate analysis (equation (1)). Table 2b presents ordinal probit analyses where the dependent variable is the effort change for manual workers (column (1)) and non-manual workers (column (2)). The dummy variable *TCOC* captures whether there has been technical or organisational change affecting the relevant group of workers. Several control variables were included, as follows. *DOWNCOM* captures whether there are channels for downward communication at the establishment (newsletters, systematic use of the management chain of communication). *UPCOM* captures whether there are company surveys or suggestion schemes, either of which permits upward communication. *TWOWAY* captures whether there are regular consultation meetings between management and other sections of the workforce. Finally, I also controlled for establishment size and union density.

The findings support *H1* robustly. Thus, organisational or technical change over the past three years is significantly associated with effort intensification, after controlling for other possible explanatory factors. Of those other factors, there are positive coefficients on *DOWNCOM* for both manual and non-manual workers, and in the former case the coefficient is on the margin of statistical significance ($p = 0.101$). This would be consistent with the view that good downward communication can help to elicit increases in effort, though the causation could easily be reversed, with effort intensification affecting the use of the policies. However,

upward communication and two-way communication have only small and insignificant links to effort change. Effort intensification for non-manual workers appears to be larger in larger establishments. The coefficient on trade union density is insignificant in both cases; however, it should be recalled that the sample is restricted to those (mainly unionised) establishments where worker representatives have responded, so no comparison is possible with non-union establishments. The presence or absence of these controls does not alter the sign or significance of the impact attributable to organisational or technical change.

Computers

Hypothesis *H2* receives strong support in a study by Green and Mcintosh (2000), who find that individuals who use computers at work are much more likely to report higher effort levels. In the estimations in this study, however, the support is mixed. As Table 6 shows, computer usage is strongly associated with greater work pressure sources (WPSI); that is, computer users experience more numerous work pressures than non-computer users. Since WPSI is strongly correlated with effort, this finding supports *H2*. There is also a significant positive bivariate correlation, not shown in the Tables, between computer use and required or discretionary effort. However, Tables 3 and 4 show there is no significant association between computer usage and required or discretionary effort, once other variables are accounted for; when multi-skilling is also included (Table 5) the association becomes negative.

One way to reconcile this mixed finding with that of Green and Mcintosh (2000) is the possibility that computer usage is correlated with other factors, and that these are better captured in this data. Computer usage is strongly correlated with skill (Green *et al*, 2000c; Autor *et al*, 1998). It should also be noted that direct computer usage is only a crude indicator of the role of information technology at the workplace. Whether a person uses a computer directly will affect the extent to which the work flow can be closely controlled and monitored

(the call centre phenomenon). However, information technology could also plays a part in delivering work without gaps to workers who may have no direct contact with a computer. This latter role cannot easily be captured with individual-level data. Hence, the idea that computerisation lies behind the intensification of work effort is not decisively rejected or accepted.

Multi-Skilling

Hypothesis *H3* can be partially evaluated using the Skills Survey data, in which there is a way of capturing the notion of multi-skilled. Respondents reported on the importance of 36 detailed activities (in addition to their use of computers) in their jobs, in each case saying whether the activity was "essential", "very important", "fairly important", "not very important", or "not at all important/not applicable" to their job. I re-coded the first two categories as one, the others as zero, and summed across all activities, to create a Multi-Skilling Index (MSI). Workers who score highly in this index are involved in a wide range of activities.[19] As Table 5 shows, there is a strong positive association between multi-skilling and both required and discretionary effort.[20] However, since multi-skilling is not able to be measured in a similar way in the earlier surveys it is not possible to determine how far multi-skilling has been associated with work intensification: one can only infer from this cross-section correlation that, assuming the correlation also held in previous years, the presumed rise in multi-skilling will have had a positive impact on work intensity.

---

[19] For the full list of activities, see Ashton *et al* (1999).

[20] This finding is robust to variations in the precise method of calculating the MSI, for example by counting answers in the "fairly important" category as one rather than zero.

Human Resource Policies

The establishment-based analysis reported above showed only a weak link between indicators of intra-firm communication policies and effort change. However, to investigate *H4* it is appropriate to examine first whether human resource policies are also associated with higher effort levels. For this, I use the individual-based equations of Tables 3, 4 and 5.

I capture "downward communication" in a workplace as a dummy variable equalling one if management holds regular meetings to either inform or consult with workers about company policies. As Tables 3, 4 and 5 show, downward communication is associated with greater required effort in the case of women, and with greater discretionary effort by both men and women. Upward communication is measured by whether or not the respondent reports making suggestions about efficiency improvements. This form of communication scheme carries a positive coefficient in all cases, and is significantly associated with both required and discretionary effort for both sexes (Tables 3 and 4). Since both upward communication and the use of suggestions expanded a little between 1992 and 1997 (see Appendix), these variables are associated with some of the work intensification, in support of hypothesis *H4*.

I capture teamworking by entering a dummy variable equalling one if respondents answered "some" or "all" to the Skills Survey question "How much of your work is organised on the basis of teams". The question was designed to capture more than just the notion of co-operating with other workers and to pick up the notion that work is organised in this way. Table 5 reveals, however, that teamworking has only a very small and insignificant association with high effort levels.[21] Thus it appears that either the posited effects of teamworking on effort are very small in practice or that the contradictory effects cancel each other out.

---

[21] This finding is robust to alternative constructions of the dummy variable.

It is widely held that teamworking in some form is an expanding form of work organisation. This supposition cannot be examined statistically, since there are no comparable questions in earlier surveys. However, in the light of the above evidence, the notion that teamworking could be an important part of an explanation for work intensification is dubious. Nevertheless, it can be noted that the proportions of employees reporting work pressure from their fellow workers rose from 29 percent in 1986 to 57 percent in 1997. Such pressure could come from a range of colleagues, not just those in organised teams. It suggests that collective pressures for hard work are increasing, even if this begs the question as to the sources of these pressures.

Upskilling

Hypothesis *H5* is partially supported by the analysis of Gallie *et al* (1998), who show that the "work strain" of employees who report upskilling over the previous five years is substantially greater than for those with either no skill change or with a perceived reduction in skills. Their measure of work strain is a composite of responses to several variables, only one of which directly captures effort change, so their finding does not directly address the posed complementarity between EBTC and SBTC. To address the complementarity of EBTC and SBTC directly, I simply cross-tabulate responses to the questions on perceived effort and skill change, as shown in Table 7. The table shows a strong positive link, with a Spearman rank correlation coefficient of 0.384. Of those reporting greater effort, some 76 per cent also reported upskilling in their job. For those whose effort had decreased, only 36 per cent had increased skills and indeed for this group a greater proportion, 43 per cent, experienced a reduction in their skills.

Further support for the complementarity of EBTC and SBTC derives from an analysis of changes in average effort and average skill for defined groups. An appropriate broad measure

of skill used in a job is a weighted average of indices of the required qualification level, the training time and the learning time, where the weights are determined from the first principal component of these indices (Green *et al*, 2000a).[22] At a crude level, one may note that skills (measured in this way) and effort both increased faster for women than for men over 1992 to 1997. More formally, I divided the EB and Skills Survey samples into 19 industry-sex cells for which the base numbers exceeded 40. The correlation coefficient (weighted by industry size) between the change in broad skills and the change in constrained effort was 0.51, with a p-value of 0.024. The correlation of skill change with the change in discretionary effort was 0.51, with p-value 0.027.

The hypothesis receives further, robust, empirical support from the effort level equations. Thus, jobs with higher required qualification levels are associated with greater required effort for both sexes and with greater discretionary effort for males (Tables 3 and 4). The relationship disappears, however, when multi-skilling is also included as an explanatory variable (Table 5). Jobs with higher required qualifications are also much more likely to experience greater sources of work pressure (Table 6). Types of work that require a long training period (over two years) also carry a greater WPSI than work which require only short training (less than one month). Thus it is possible to conclude that higher skilled jobs are, indeed, on average high effort jobs. This latter finding is supported in some, though not all, of previous studies of effort level determinants (Mcintosh, 1997).

Taking these pieces of evidence together, the conjecture that EBTC and SBTC are complementary is robustly supported.

---

[22] The learning time index is calculated from responses to the question “How long did it take for you after you first started doing this type of job to learn to do it well?”; the required qualification level is indexed from 0 (none) to 5 (degree or above); training time index measures the length of training received for the type of work being performed.

Competitiveness

Hypothesis *H6* cannot be formally tested with current statistical data, but it may nevertheless be important. Burchell *et al* (1999) trace the process through which intensification of product market competition feeds through to greater pressure for flexibility on the part of suppliers and sub-contractors, to redundancies, and to a more flexible core workforce that works itself to the limit. These processes are verified through in-depth interviews with managers in 20 heterogeneous establishments and with 340 of their employees. Nevertheless, the organisations and workers covered by Burchell *et al* do not present a picture of generally rising wage levels. The study, therefore, is unable to trace out a process of simultaneously increasing wage and effort levels. Rather, the implication of the overriding dominance of increasing competition as explanatory factor is that real wages would fall – something which we do not observe in the aggregate.

Unions

Hypothesis *H7* can be tested indirectly by examining the impact of unionism on reported effort levels. The few earlier empirical investigations of this issue show mixed results. Green and Mcintosh (1998) found, in a study of UK establishments, that unions do not directly affect effort but have an indirect effect of modifying the impact of the external economic environment. Belman *et al* (1992) show an unambiguous downward impact of unions on a range of effort proxies. In a direct test of whether changing union power has an impact on

work intensity, Green and Mcintosh (2000) find that declining union density is strongly correlated at the national level with rising work effort.[23]

In the evidence presented here, union coverage is associated with lower required and discretionary effort, as predicted, for men, but there is no significant link with women's effort intensity (Tables 3 and 4). When the analysis is confined to the Skills Survey sample, and additional measures are included, the impact of unions on effort remains negative but is no longer significantly different from zero (Table 5).[24] When the analysis is applied to the WPSI (Table 6), union coverage is positively associated with effort pressures on women. As with the union/non-union wage gap literature, union coverage may be endogenous. If workers join unions when they find that effort requirements of the job are getting too high, we would observe a positive correlation of unionism with effort. Moreover, individual heterogeneity could be causing the negative link for men, if an unobserved characteristic were associated with choosing low effort jobs and joining a union.

During the period 1992 to 1997, union coverage for men declined by roughly 4 percentage points (see Appendix). In the case of men, this decline is associated with no more than a tenth of the rise in average required work effort. For women the impact is of ambiguous sign and also small. So there is no strong support for *H7* from these data. Nevertheless, the impact of unions' decline may be understated with individual-level data: the impact of their falling power may be felt both inside and outside the union sector.

---

[23] In that study Green and Mcintosh could not directly estimate unions' effect at the individual level, but could pick up unions' effect through country-level variations.

[24] Omitting the multi-skilling indicator renders the union coefficient just significant at 10%.

Job Insecurity

The hypothesis that job insecurity is an important factor driving work intensification is examined in Tables 5 and 6. Two main elements of insecurity are the fear of losing the job, and the consequences of job loss if it happens. The first element is captured by a question asking respondents to assess (on a scale from 0 to 5) the chances that they would lose their job and become unemployed in the ensuing year. The second element is measured by a question that asks respondents to assess the chances (on a scale from 1 to 4) that they could, in the event of job loss, regain a job "as good as the current one" (see Green *et al*, 2000b, for details). Since these elements interact to create the risk faced by workers, I define a Job Insecurity Index (JSI) to be the product of the two scales. The JSI thus ranges from 0 to 20. The results show that the JSI has only a very small and insignificant association with work effort. In addition, in other analyses not shown, the constituent elements are also unrelated to effort, and plausible variations in the definitions yield no change to this pattern. This rather spectacular failure to show any association strongly refutes hypothesis *H8*. Moreover, partly because unemployment has fallen in Britain, perceived job insecurity appears not to have risen between 1986 and 1997 (Green *et al*, 2000b). Yet, one must add a reservation that the notion of job insecurity can be a lot broader than the prospects for job loss. In so far as job insecurity is associated with the fear of failure to do well in the job, achieve promotion, and gain pay increases, it remains possible that insecurity in this wider sense could be linked to effort.

Residual Trend

The estimates for females' required effort show a significantly positive coefficient of 0.23 for the 1997 year dummy. Since a simple estimate that includes no other variables generates a point estimate of 0.24, I conclude that none of the intensification of females' required effort is explained by changes in the variables in the data. This suggests that other factors – possibly

organisational and technical change – must be the source of change. For males, however, the year dummy coefficient is small and insignificantly different from zero, suggesting that changes in the RHS variables are collectively associated with male work intensification. In fact, the fall in union coverage together with the rise of computer use "account" on their own for a fall in the year dummy coefficient from 0.075 to 0.039. Similarly, the upward trend in females' discretionary effort is associated with changes in the RHS variables. However, the coefficients for the 1997 year dummy in Table 6 show that there remains a substantive and significant rise in the work pressure index that is not accounted for by changes in computer use, union coverage or observed job skills.

5. Conclusion

I have described in this paper an in-depth investigation of factors underlying the intensification of work in late 20th century Britain. There is also evidence of work intensification during the 1990s in most other countries of the European Union, but it is only in Britain, where several measures of work effort are available at multiple time points, that one can examine several key reasons for intensification using statistical methods.

The single most likely source of work intensification is effort-biased technological change, whereby the productivity of high effort work is enhanced to a greater degree than that of low effort work. I have argued that well-known and widespread management methods such as Total Quality Management and Just In Time production, together with new information technology, can be characterised as EBTC.[25] The evidence to support this conjecture is strong

[25] I have not investigated the origins of EBTC, treating it for the purposes of this paper as exogenous.

but far from decisive. Organisational or technical change does appear to be linked to work intensification. There is also some evidence that computer usage is linked to high effort. However, here the picture is less robust and in any case individual computer usage may not be the best indicator of the role of computers in determining effort. The development of multi-skilling is part of the story of EBTC, permitting, as it does, the deployment of workers on different tasks where otherwise they would have been left idle. The development of intra-firm communication policies is also found to be linked with intensification.

Other proximate factors have also been shown to have a role in determining effort. These include the decline of unions, a factor that plays a significant part in explaining the difference in the work intensification experiences of several European Union countries. The intensification of product market competition, perhaps associated with global trade expansion, may also have been important but there are no obvious ways to measure this effect.

One aspect of some of modern technology is the improvement in the ability to monitor work flows. The direct impact of this improvement is to facilitate the “amber lights” phenomenon whereby management can determine work flows at an optimum speed. An alternative implication, frequently drawn, is that improved monitoring has helped to raise job insecurity, inducing workers to reduce their shirking. However, the evidence decisively refutes this popular explanation of intensification. Job insecurity, at least as defined in terms of the combined risk of job loss and consequent costs of job loss, is not linked with greater work effort.

In drawing any welfare implications from these findings one must be careful to draw a distinction between working harder than before and “over-working”. The latter concept has been operationalised in formal terms, for example as sub-optimal amounts of short-hours work contracts (Rebitzer and Taylor, 1995) or in psychological terms as in the analysis of workaholism (Scott *et al*, 1997). Over-work could be a problem whether or not work

intensification is occurring. Nevertheless the one could lead to the other, and there is evidence that high work effort is associated with stress, and has implications for family members of high effort workers.

If technology is the chief source of intensification, the first implication is that technologies should be fashioned to capture improvements in deficiencies but not to require high effort. To the extent that the state, or any social agent, can affect technical and work organisation changes, it might be to give incentives for technologies that equally improve the productivity of low-effort work. Such a change would complement advice from multiple counsellors, and teachers of time-management skills, which is summed up in the phrase “work smarter, not harder”. A second implication is that there remains an important role for trade unions in resisting excessively high effort at the workplace. The decline of collective bargaining has forced employees more to make their own settlement over effort levels, with the result that effort has been intensified, with consequent effects for some on their stress levels.

Finally, there is a need to develop our understanding further about the links between technical, organisational and institutional changes at the workplace and the conditions of work. This and other research has shown that meaningful measures of work effort are obtainable through survey methods. Careful design of survey instruments should make it possible to learn more about the implications for work intensity of different forms of technical and organisational change.

References

ACTU (1998). *A Report on the 1997 ACTU National Survey on Stress at Work*. ACTU Occupational Health and Safety Unit.

Andrews, M. and R. Simmons (1995). "Are Effort Bargaining Models Consistent with the Facts? An Assessment of the Early 1980s." *Economica* 62(August): 313-334.

Ashton, D., B. Davies, A. Felstead and F. Green (1999). *Work Skills In Britain*. Oxford, Centre for Skills, Knowledge and Organisational Performance, Oxford and Warwick Universities.

Autor, D. H., L.F. Katz and A.B. Krueger (1998). "Computing inequality: have computers changed the labour market?" *Quarterly Journal of Economics*, 113(4): 1269-1214.

Barker, J. and H. Downing (1980) "Word processing and the transformation of the patriarchal relations of control in the office", *Capital and Class*, 10, 64-99.

Barzel, Y. (1973) "The determination of daily hours and wages". *Quarterly Journal of Economics*, 88, 220-238.

Batsone, E. and S. Gourlay (1986). *Unions, Unemployment and Innovation*. Oxford, Blackwell.

Belman, D., R. Drago and M. Wooden (1992). "Workgroups, efficiency wages and work effort." *Journal of Post Keynesian Economics*, 14(4): 497-521.

Bielby, D.D. and W.T. Bielby (1988). "She Works Hard for the Money: Household Responsibilities and the Allocation of Work Effort", American Journal of Sociology, 93 (5): 1031-59.

Booth, A. and M. Francesconi (1997). "Career Mobility in Britain", Discussion Paper 97/16, Institute for Labour Research, University of Essex.

Bowles, S. (1985). "The production process in a competitive economy - Walrasian, Neo-Hobbesian, and Marxian models." *American Economic Review*, 75(1): 16-36.

Braverman, H. (1974). *Labor and Monopoly Capital*. New York, Monthly Review Press.

Bresnahan, T.F. (1999). "Computerisation and Wage Dispersion: An Analytical Reinterpretation." *Economic Journal* 109 (June): F390-F415.

Bresnahan, T.F., E. Brynjolfsson, *et al*. (1999). *Information Technology, Workplace Organization and the Demand for Skilled Labor: Firm-Level Evidence*, National Bureau of Economic Research, Working Paper 7136.

Burchell, B.J., D. Day, M. Hudson, D. Ladipo, R. Mankelow, J. Nolan, H. Reed, I. Wichert and F. Wilkinson (1999). *Job Insecurity and work intensification; flexibility and the changing boundaries of work*. Joseph Rowntree Foundation report.

Cappelli, P., L. Bassi, H. Katz, D. Knoke, P. Osterman and M. Useem (1997). *Change at Work*. Oxford & New York, Oxford University Press.

Caroli, E. and J. Van Reenen (1999). "Skills and Organizational Change: Evidence from British and French establishments in the 1980s and 1990s", Institute for Fiscal Studies, Working Paper W99/33.

Caulkin, S. “As technology speeds up, work is becoming nasty, brutish and long”, *Observer*, 30 August, 1998.

Delbridge, R., P. Turnbull and B. Wilkinson (1992). “Pushing back the frontiers: Management control and work intensification under JIT/TQM factory regimes.” *New Technology, Work and Employment* 7 (2): 97-106.

deVries, M. F. R. K. and K. Balazs (1997). “The downside of downsizing.” *Human Relations* 50(1): 11-50.

Edwards, P. K. and C. Whitston (1991). “Workers are working harder - effort and shop-floor relations in the 1980s.” *British Journal of Industrial Relations* 29(4): 593-601.

Edwards, P., M. Collinson and C. Rees (1998). “The determinants of employee responses to total quality management: Six case studies.” *Organization Studies* 19(3): 449-475.

Elger, T. (1990). “Technical innovation and work reorganization in British manufacturing in the 1980s: continuity, intensification or transformation?” *Work, Employment and Society* 4 (Special Issue, May): 67-102.

European Foundation for the Improvement of Living and Working Conditions (1997). *Working Conditions in the European Union*. Luxembourg, Office for Official Publications of the European Communities.

Evans, S., K. Ewing and P. Nolan (1992). “Industrial-Relations and the British Economy in the 1990s-Thatcher Legacy.” *Journal of Management Studies* 29 (5): 571-589.

Felstead, A., F. Green and K. Mayhew (1997). *Getting The Measure Of Training*. Leeds, Centre for Industrial Policy and Performance, University of Leeds.

Freeman, R. and J. Medoff (1984). *What Do Unions Do?*, New York: Basic Books.

Gallie, D., M. White, Y. Cheng and M. Tomlinson (1998). *Restructuring The Employment Relationship*. Oxford, Clarendon Press.

George, D. (1997). “Working longer hours: Pressure from the boss or pressure from the marketers?” *Review of Social Economy* 55(1): 33-65.

Green, F. (1999). “It’s Been A Hard Day’s Night: The Concentration And Intensification Of Work In Late 20th Century Britain”, Discussion Paper 99/13, Department of Economics, University of Kent.

Green, F. (2000). “The impact of company human resource policies on social skills: implications for training sponsorship, quit rates and efficiency wages.” *Scottish Journal of Political Economy*, forthcoming.

Green, F. and S. Mcintosh (1998). “Union Power, Cost of Job Loss, and Workers’ Effort.” *Industrial & Labor Relations Review* 51(3): 363-383.

Green, F. and S. Mcintosh (2000). “The Intensification of Work in Europe”, Discussion Paper, Centre for Economic Performance, London School of Economics.

Green, F. and T.E. Weisskopf (1990). “The worker discipline effect - a disaggregative analysis.” *Review of Economics and Statistics* 72(2): 241-249.

Green, F., D. Ashton, B. Burchell, B. Davies and A. Felstead (2000a). “Are British Workers Getting More Skilled?” *The Over-Educated Worker? The Economics of Skill Utilisation*. L. Borghans and A. d. Grip. Cheltenham, Edward Elgar.

Green, F. Felstead, A. and Burchell, B. (2000b). "Job Insecurity And The Difficulty Of Regaining Employment: An Empirical Study Of Unemployment Expectations", *Oxford Bulletin of Economics and Statistics*, forthcoming.

Green, F., A. Felstead and D. Gallie (2000c). "Computers Are Even More Important Than You Think. An Analysis Of The Changing Skill-Intensity Of Jobs", London School of Economics, Centre for Economic Performance, Discussion Paper 439.

Gregg, P. and J. Wadsworth (1996), "It Takes Two: Employment Polarisation in the OECD", London School of Economics, Centre for Economic Performance, Discussion Paper 304.

Gregg, P. and J. Wadsworth (eds.) (1999). *The State of Working Britain*, Manchester: Manchester University Press.

Heyes, J. (1996). "A Formula for Success? Training, Reward and Commitment in a Chemicals Plant." *British Journal of Industrial Relations* (September): 351-370.

Hildreth, A. (1999). "What has happened to the union wage differential in Britain in the 1990s?" *Oxford Bulletin of Economics and Statistics* 61 (1): 5-.

Holman, D. and S. Fernie (2000). "Can I help you?" *CentrePiece* 5(1): 2-5.

Ichniowski, C., T.A. Kochan, *et al*. (1996). "What Works At Work: Overview and Assessment." *Industrial Relations* 35(3): 299-333.

IRS (1996). "Working harder, working longer: managers' attitudes to work revisited", *IRS Employment Review*, 600, January.

Itoh, H. (1991). "Incentives to help in multiagent situations". *Econometrica*, 59, (3): 611-636.

Jacobsen, L., R. Lalonde and D. Sullivan (1993). "Earnings Losses of Displaced Workers." *American Economic Review* (September): 685-709.

Kandel, E. and E.P. Lazear (1992). "Peer Pressure and Partnership." *Journal of Political Economy* 100 (4): 801-817.

Lawler, E.E., S.A. Mohrman and G.E.J. Ledford (1995). *Creating High Performance Organizations*. San Francisco, Jossey-Bass.

London Hazards Centre (1994) *Hard Labour*, London: London Hazards Centre Trust Ltd.

Macduffie, J.P. (1995). "Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the world auto industry." *Industrial and Labor Relations Review* 48 (2): 197-221.

Mcintosh, S. (1997) "The Determinants of Workers' Effort: Theory and Evidence" PhD Thesis, London School of Economics.

Milgrom, P. and J. Roberts (1990). "The economics of modern manufacturing: technology, strategy and organization." *American Economic Review* 80 (6): 511-528.

Millward, N., M. Stevens, D. Smart and W.R. Hawes (1992). *Workplace Industrial Relations in Transition*. Aldershot, Dartmouth Publishing Co. Ltd.

Mishra, K. E., G.M. Spreizer and A.K. Mishra (1998). "Preserving employee morale during downsizing." *Sloan Management Review* 39 (2): 83-.

Nickell, S., T. Jones and G. Quintini (1999). "A Picture of the Job Insecurity Facing British Men", London School of Economics, Centre for Economic Performance, mimeo.

Oliver, J.M. and J.R. Turton (1982). “Is there a shortage of skilled labour?” *British Journal of Industrial Relations* (20): 195-200.

O’Mahony, M. (1994). “Can Britain Bridge The Productivity Gap?” *Long Range Planning* 27(2): 85-94.

Oliver, N. (1991). “The dynamics of just-in-time.” *New Technology, Work and Employment* 6(1): 19-42.

Penn, R., M. Rose and J. Rubery (eds.) (1994). *Skill and Occupational Change*. Oxford, Oxford University Press.

Rebitzer, J.B. and L.J. Taylor (1995). “Do labor-markets provide enough short-hour jobs - an analysis of work hours and work incentives.” *Economic Inquiry* 33(2): 257-273.

Roach, S.S. (1996). “The hollow ring of the productivity revival”. *Harvard Business Review* 74 (6): 81-86.

Schor, J. (1991). *The Overworked American*, Basic Books.

Scott, K. S., K.S. Moore and M.P. Miceli (1997). “An exploration of the meaning and consequences of workaholism.” *Human Relations* 50(3): 287-314.

Sewell, G. and B. Wilkinson (1992). “Someone to watch over me: Surveillance, discipline and the just-in-time labour process.” *Sociology* 26: 271-289.

Shapiro, C. and J.E. Stiglitz (1984). “Equilibrium unemployment as a worker discipline device.” *American Economic Review* 74(3): 433-444.

Sherwen, P. “Working to live or living to work”, *The Guardian*, 11 September, 1999.

Stalk, G. and T.M. Hout (1990) *Competing against time: how time-based competition is reshaping global markets*. New York, Free Press.

Stewart, M. (1995). “Union wage differentials in an era of declining unionization.” *Oxford Bulletin of Economics and Statistics* 57(2): 143-166.

Taplin, I.M. (1996). “Rethinking flexibility: The case of the apparel industry".” *Review of Social Economy* 54(2): 191-220.

Tomaney, J. (1990) “The reality of workplace flexibility”, *Capital and Class*, 40(Spring): 29-60.

Waterson, P., C.W. Clegg, R. Bolden, K. Pepper, P.B. Warr and T.D. Wall (1999). “The use and effectiveness of modern manufacturing processes: A survey of UK industry.” *International Journal of Production Research* 37: 2271-2292.

Wazir, B. (1999) “Life at the end of the line” in *The Observer*, 21/11/1999.

Wilkinson, A., G. Godfrey and M. Marchington (1997). “Bouquets, brickbats and blinkers: total quality management and employee involvement in practice.” *Organization Studies* 18(5): 799-820.

Wood, S. (1999). “Human resource management and performance.” *International Journal of Management Reviews* 1 (4): 367-413.

Table 1: Description of Effort Intensification, 1986-1997

	Required Effort		Discretionary Effort		Work Pressure Sources Index†	
	1992	**1997**	**1992**	**1997**	**1986**	**1997**
All	2.20	2.29	2.57	2.63	1.92	2.83
Male	2.18	2.24	2.55	2.58	2.00	2.81
Female	2.21	2.33	2.59	2.69	1.82	2.86
Under 40	2.20	2.26	2.55	2.61	2.06	2.92
40 or more	2.19	2.32	2.60	2.65	1.70	2.71
Non-Manual	2.26	2.36	2.65	2.70	2.08	2.99
Manual	2.11	2.13	2.45	2.47	1.76	2.52
Manufacturing	2.15	2.18	2.51	2.54	1.89	2.65
Services	2.21	2.31	2.56	2.65	1.93	2.88
Private Sector	2.20	2.27	2.58	2.62	1.94	2.76
Public Sector	2.18	2.34	2.56	2.66	1.87	2.96
Employees	2.18	2.26	2.55	2.61	-	-
Self-Employed	2.35	2.47	2.74	2.76	-	-

Note: † Employees only.

Data sources: Social Change and Economic Life Initiative, Employment in Britain, and Skills Survey. For effort measure, see text.

Table 2a: Effort Intensification by Technical/Organisational Change

Percent experiencing "a lot higher" work intensity

	Manual Workers	**Non-Manual Workers**
No technical or organisational change	21.6	33.0
Either technical or organisational change or both	36.4	49.2

Note: Proportions calculated using sample probability weights.

Table 2b: Determinants of Effort Intensification

Ordinal Probit Estimates

	Manual Workers	**Non-Manual Workers**
TCOC	0.31 (0.10)**	0.29 (0.12)**
TWOWAY	0.04 (0.11)	0.04 (0.13)
DOWNCOM	0.22 (0.14)	0.17 (0.18)
UPCOM	-0.04 (0.09)	-0.00 (0.10)
ESTABLISHMENT SIZE (1000s of employees)	0.044 (0.048)	0.091 (0.048)*
UNION DENSITY (Manual/non-manual) (%)	-0.014 (0.018)	0.20 (0.17)
Pseudo-R^2	0.01	0.01
n	548	622

Notes:
1. Dependent variable is effort change on 5-point scale from "a lot lower" (0) to "a lot higher" (4).
2. Standard errors in parentheses; significance levels: * = 10%, ** = 5%.

Data Source: Workplace Industrial Relations Survey.

Table 3: Determinants of Required Effort

Ordinal Probit Estimates; Pooled Sample

	Males	**Females**
1997 Year Dummy	0.00 (0.04)	0.23 (0.05)**
Computer Used	0.05 (0.05)	-0.01 (0.06)
Downward Communication	0.07 (0.05)	0.19 (0.05)**
Suggestion Scheme	0.25 (0.05)**	0.21 (0.05)**
Union Coverage	-0.14 (0.05)**	0.04 (0.05)
Qualification Requirement:		
Level 1	0.09 (0.09)	0.14 (0.11)
Level 2	0.08 (0.07)	0.04 (0.07)
Level 3	-0.00 (0.07)	0.06 (0.09)
Level 4	0.20 (0.08)**	0.36 (0.09)**
Level 5	0.33 (0.08)**	0.35 (0.09)**
Training Time > 2 years	0.08 (0.07)	-0.02 (0.08)
Training Time < 3 months	0.12 (0.07)	-0.19 (0.07)**
Pseudo R^2	0.025	0.059
n	2619	2482

Notes:
1. Dependent variable is required effort, on a 4 point scale from "strongly disagree" to "strongly agree". See text.
2. Employees only. All equations include controls for establishment size, weekly work hours and age.
3. Standard errors in parentheses; significance levels: * = 10%, ** = 5%.

Data source: Employment in Britain, 1992 and Skills Survey, 1997.

Table 4: Determinants of Discretionary Effort

Ordinal Probit Estimates; Pooled Sample

	Males	**Females**
1997 Year Dummy	-0.05 (0.05)	0.08 (0.06)
Computer Used	0.06 (0.06)	-0.06 (0.06)
Downward Communication	0.19 (0.05)**	0.19 (0.06)**
Suggestion Scheme	0.22 (0.06)**	0.39 (0.06)**
Union Coverage	-0.26 (0.06)**	-0.02 (0.06)
Qualification Requirement:		
Level 1	0.12 (0.09)	0.08 (0.13)
Level 2	0.29 (0.08)**	0.05 (0.08)
Level 3	0.20 (0.08)**	0.00 (0.11)
Level 4	0.38 (0.09)**	0.02 (0.11)
Level 5	0.28 (0.09)**	-0.08 (0.11)
Training Time > 2 years	0.08 (0.08)	0.01 (0.09)
Training Time < 3 months	0.00 (0.07)	0.01 (0.08)
Pseudo R^2	0.039	0.041
n	2619	2487

Notes:
1. Dependent variable is required effort, on a 4 point scale from "strongly disagree" to "strongly agree". See text.
2. Employees only. All equations include controls for establishment size, weekly work hours and age.
3. Standard errors in parentheses; significance levels: * = 10%, ** = 5%.

Data source: Employment in Britain, 1992 and Skills Survey, 1997.

Table 5: Determinants of Effort, 1997

Ordinal Probit Estimates

	Required Effort		Discretionary Effort	
	Males	**Females**	**Males**	**Females**
Computer Used	-0.07 (0.09)	-0.21 (0.10)**	-0.08 (0.11)	-0.32 (0.12)**
Downward Communication	-0.001 (0.08)	0.21 (0.09)**	0.15 (0.09)*	0.09 (0.10)
Suggestion Scheme	0.16 (0.09)*	0.08 (0.09)	0.13 (0.09)	0.20 (0.10)**
Union Coverage	-0.07 (0.07)	-0.02 (0.08)	-0.14 (0.08)	-0.06 (0.10)
Qualification Requirement:				
Level 1	-0.09 (0.13)	0.22 (0.16)	0.02 (0.14)	-0.17 (0.19)
Level 2	-0.18 (0.11)	0.11 (0.11)	-0.01 (0.12)	-0.09 (0.14)
Level 3	-0.21 (0.12)*	0.11 (0.15)	-0.01 (0.13)	-0.23 (0.18)
Level 4	-0.07 (0.14)	0.26 (0.16)	0.06 (0.16)	-0.46 (0.19)**
Level 5	0.11 (0.13)	0.48 (0.16)**	-0.06 (0.14)	-0.38 (0.18)**
Training Time > 2 years	-0.05 (0.11)	0.06 (0.12)	0.22 (0.13)*	-0.19 (0.15)
Training Time < 3 months	0.11 (0.11)	-0.00 (0.11)	0.12 (0.12)	-0.11 (0.14)
Multiskilling Index†	0.044 (0.006)**	0.036 (0.006)**	0.046 (0.006)**	0.054 (0.007)**
Teamworking	0.04 (0.08)	-0.01 (0.09)	0.05 (0.09)	-0.02 (0.10)
Job Insecurity Index‡	-0.01 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)
Pseudo R^2	0.048	0.071	0.073	0.072
n	1053	1000	1052	1003

Notes:
1. Employees only. All equations include controls for establishment size, weekly work hours and age.
2. Standard errors in parentheses; significance levels: * = 10%, ** = 5%.
3. † The Multiskilling Index is the number of activities which are either “very important” or “essential” parts of the job. Its maximum theoretical range is 0 to 36.
4. ‡ The Job Insecurity Index is the product of an index of the expectation of job loss and an index of the difficulty of regaining an equally good job; it ranges from 0 to 20. See text.

Data source: Skills Survey, 1997.

Table 6:Determinants of Work Pressure

Pooled SCELI and Skills Survey Sample; OLS Estimates.

	Males	**Females**
1997 Year Dummy	0.77 (0.05)**	0.80 (0.05)**
Computer Used	0.17 (0.06)**	0.21 (0.06)**
Union Coverage	-0.02 (0.05)	0.11 (0.05)**
Job Insecurity Index‡	-0.00 (0.01)	0.00 (0.01)
Qualification Requirement:		
Level 1	0.16 (0.09)*	0.22 (0.11)*
Level 2	0.20 (0.08)**	0.27 (0.07)**
Level 3	0.32 (0.10)**	0.41 (0.10)**
Level 4	0.37 (0.10)**	0.42 (0.09)**
Level 5	0.52 (0.09)**	0.44 (0.10)**
Training Time > 2 years	-0.03 (0.08)	0.17 (0.09)*
Training Time < 3 months	-0.13 (0.08)*	-0.09 (0.07)
Adjusted R^2	0.125	0.199
n	2672	2584

Notes:
1. Dependent variable is the Work Pressure Sources Index; see text for details.
2. Employees only; Employees only. All equations include controls for establishment size, age and part-time/full-time status.
3. ‡ See notes to Table 5.
4. Standard errors in parentheses; significance levels: * = 10%, ** = 5%.

Data source: Social Change and Economic Life Initiative, 1986 and Skills Survey, 1997.

Table 7: Perceived Skill Change by Perceived Effort Change

	Among Workers Whose Effort Over Five Years:		
% for whom:	Decreased	Stayed the Same	Increased
Skills Decreased	42.6	5.6	6.7
Skills Unchanged	21.1	54.1	17.1
Skills Increased	36.3	40.3	76.3

Data source: Employment in Britain, 1992.

Appendix: Data Descriptions and Means

(a) RHS variables in the WIRS90 Analysis

RHS Variable	Brief Description	Manual Worker Sample	Non-manual Worker Sample
TCOC	Technical or Organisational Change in last 3 years	78.3	79.7
TWOWAY	Consultation meetings	79.1	82.7
DOWNCOM	Newsletters, use of management chain	87.3	91.4
UPCOM	Suggestion schemes, company surveys	51.4	57.1
ESTABLISHMENT SIZE	Number of employees in plant	798	914
UNION DENSITY (%)	Union members as % of total workforce	81.6	64.3

(b) RHS variables in SCELI, EIB and the Skills Survey

RHS Variable	Brief Description	SCELI (1986)	EIB (1992)	Skills Survey (1997)
Computer Used	Use of computer or computerised equipment	0.40	0.56	0.72
Downward Communication	Meetings to inform or consult workers	na	0.59	0.63
Suggestion	Suggestion(s) made in last year	na	0.67	0.73
Union Coverage	Unions present at workplace	0.58	0.59	0.55
Qualification Requirement	Highest qualification required to get job, equivalent to:			
Level 1	GCSE grades D and below	7.2	5.0	9.2
Level 2	GCSE grades A-C	19.2	19.6	21.7
Level 3	A-level	14.6	15.9	12.9
Level 4	Higher National Diplomas	11.0	12.7	10.4
Level 5	Degree	10.2	13.8	14.7
Training Time > 2 years	Total training for type of work	21.8	21.9	29.2
Training Time < 3 months	as above	0.66	0.62	0.57
Multiskilling Index	Number of activities that are essential or very important, 0 to 36	na	na	19.5
Teamworking	Some or all work organised in teams	na	na	0.64
Job Insecurity Index	Product of fear of job loss and perceived cost of job loss	2.20	na	2.10

Note: Employees only. Averages in each case are based on the entire sample, which differs from the sample used for estimations because of some missing values on other variables.