Abstract

This paper presents evidence that, across many European countries, the 1990s have witnessed an intensification of labour effort, and investigates explanations for this process. Using data drawn from The European Survey on Working Conditions, we construct an index of work effort and show that it has reasonable properties in relation to other variables. We find that Britain has experienced the fastest rise in work effort, while in western Germany, Denmark and Greece there has been very little intensification of work effort. We show that work effort is higher in jobs that use computers more frequently, and in jobs that are more open to competitive pressures. Work effort has increased faster in countries where trade union density has declined the most. These factors are able to explain a large portion of the variation in the change of work effort between countries, but there remains a significant shift in work effort that is not accounted for by available explanatory variables.

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Working on the Chain Gang?
An Examination of Rising Effort Levels in Europe in the 1990s

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Introduction

This paper presents evidence that, across many European countries, the 1990s has witnessed an intensification of labour effort, and investigates explanations for this process.

Why should this be worthy of study? On a welfare level, labour intensification will reduce the utility (increase the disutility) associated with work. Physical exhaustion and mental stress are two undesirable outcomes that can result from overwork. Evidence to support such effects on individuals' health can be found in McCormick and Cooper (1988) and London Hazards Centre (1994). Green (1999) reveals a statistically significant positive effect of work effort on stress. If the stress of one individual affects those around him or her, for example in a family situation, then labour intensification can reduce the welfare of more individuals than those actually doing the work. Finally, at a time when parental support and interest in young childrens' early development is being argued to be crucial, more energies devoted to work will reduce the capacity to perform such a vital role (Hutton, 1999).

On the other side of the coin, increased effort at work implies greater output, provided that it is not more than matched by diminished efficiency. Indeed, it has been argued that a major source of the productivity 'miracle' of the 1980s in British manufacturing was the intensification of labour (see Evans *et al*, 1992; Nolan, 1989; O'Mahoney, 1994). If this is the case, however, it casts doubt on the ability of the British economy to sustain such productivity growth, since labour can only be intensified up to a certain point. It is, therefore, important to ascertain whether work effort has indeed been rising.

Increased work levels can manifest themselves in two ways: longer hours spent at work, and greater work effort during a given period of time (or a combination of the two). The focus of this paper will be on the, empirically more opaque, concept of work effort. We utilise data drawn from The European Survey on Working Conditions, which has been conducted twice, in 1991 and 1996. Each survey includes questions concerning the pace of work and the existence of tight deadlines. We use responses from both years, to obtain information about the change in effort levels, across all 12 countries that were in the EU in 1991[1], with data being collected separately for east and west Germany. We then attempt to explain the changes in effort over time that we observe. This analysis is carried out at two levels. First, characteristics of the individual respondents and their jobs are included in an effort equation, to determine whether such variables can explain any of the effort change. Then, a country level equation is estimated, in which the average effort change is related to macro characteristics of each country.

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[1] Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom.

From this dual-level analysis we conclude that computerisation is associated with higher work effort, and that cross-national variations in work intensification can best be explained by variations in the decline of trade union strength. Nevertheless there remains a significant shift to greater work intensity that is not associated with any of our measurable explanatory variables.

This introduction is followed by a literature review, and then a theoretical section sets out possible influences on effort choices. The data to be used is then described, and the findings summarised. A final section concludes.

2. Literature Review

Effort as an economic concept has grown in prominence in the economic literature, despite the problems involved in measuring and defining it. After Leibenstein (1976, 1979) highlighted the importance of studying the internal workings of firms and workers' effort choices in a series of books and articles concerned with the concept of X-efficiency, effort really obtained a foothold in mainstream economic thought with the introduction of efficiency wage theories. The aim of such theories is to explain why it can be in the interests of firms to maintain wages above their market-clearing level, and thus cause unemployment (Akerlof and Yellen, 1986). The benefits of higher wages, which make such a policy worthwhile to firms, are variously described as a lower quit rate (Salop, 1979), better quality applicants to job vacancies (Weiss, 1980), and higher effort levels or reduced shirking levels (Akerlof, 1982; Shapiro and Stiglitz, 1984; Bowles, 1985). Thus, the last theory argues that effort responds positively to wages, offering a testable prediction that brought effort into the empirical economic literature.

A growing number of such studies have been carried out, using a range of methods for measuring effort. Indirect tests involve using productivity data to proxy effort. For example, Rebitzer (1987, 1988) shows that productivity growth is positively related to unemployment rates (as predicted by the 'shirking model') across a sample of industries. Alternatively, effort can be treated as the residual in a production function, as in Wadhwani and Wall (1991), Machin and Manning (1992) and Levine (1992), who all find this 'effort residual' to be positively related to wages. A final indirect method of testing has linked hours of work negatively to unemployment rates, leading to the conclusion that higher unemployment rates increase effort and so reduce the hours needed to perform a job (Green and Weisskopf, 1990; Oster, 1980). None of these studies directly examine the relationship between effort and wages or unemployment, however, presumably because of the difficulties involved in measuring effort. A smaller empirical literature has attempted to measure such a relationship directly, by using self-reported effort data. Drago (1991), Drago and Heywood (1992) and Fairris and Alston (1994) all use individual level data sets which include a question asking respondents to report on their effort levels in some way. The results consistently support the proposition that effort is positively related to wages. Nevertheless, this positive relationship is not the sole precinct of efficiency wage theories, since even where effort is observable by employers there would be a compensating differential for high effort in a competitive labour market. By the same token, the theoretical importance of the concept of effort is not confined to the domain of efficiency wage models.

This paper similarly uses self-reported effort data to examine labour intensification over time. While the use of self-reported data may be viewed with scepticism by some economists, previous work has offered a justification for such use. This literature has been summarised in, for example, Guest (1990) and Green and McIntosh (1998), and will not be discussed in full again

here. Essentially, the research describes how, in laboratory tests where the physical or mental effort required to complete certain tasks can be measured accurately, such measurements correlate closely with the perceptions of the individuals performing the tasks as to how much effort they are exerting. In addition, Green (1999) shows that self-reported effort levels are correlated with measures of work stress and measures of productivity, as would be expected if self-reported effort was picking up real work behaviour. He also finds a close correlation between independent employees' and line managers' estimates of employees' effort levels.

One of the problems with self-reported effort levels is the units in which to measure such a variable. Formal measurements, for example in terms of units of energy will be unknown to individuals and so cannot be determined. The vast majority of questions attempting to elicit information on work effort therefore ask the respondent to locate their effort level on some scale. Can such responses be interpreted as genuine measures of effort? Green (1999) shows how, if the data are treated not as direct effort measures but as effort measures relative to some effort norm, then the interpretation is valid, and individuals can report some unit-free measure of their relative effort level. Then, if the effort norm is consistent across individuals, their self-reported effort levels can be compared.

However, this paper is cross-national in its perspective, and the assumption of consistent effort norms across individuals may not be reasonable. If effort norms within countries remain consistent over time, however, then we can compare the changes in self-reported effort in each country, to determine where the process of labour intensification is proceeding fastest, even if differences across countries in the level of self-reported effort are hard to interpret. This is the methodology that will be pursued below.

Previous research has had a similar aim of documenting changes in effort over time, although not adopting the international approach used here. Elger (1990) uses case study evidence to argue that the UK manufacturing sector witnessed a rise in effort levels during the 1980s. Tomaney (1990) reviews available case study evidence to reach a similar conclusion regarding labour intensification. Nichols (1991) uses proxy measures of effort to argue that high productivity growth and low investment in the UK manufacturing sector in the early 1980s imply higher effort. A small number of papers have used the self-reporting methods in order to obtain effort data. Most only survey workers in a limited number of workplaces, but consistently find rising effort levels for a range of time periods, for example Batstone and Gourlay (1986) for a sample of shop stewards in a range of manufacturing plants for the period 1979-1984, Edwards and Whitson (1991) for respondents in four organisations between 1987 and 1989, Edwards *et al* (1998) for respondents in six organisations during the 1990s and Burchell *et al* (1999) for respondents in twenty organisations over the period 1992-1997. In addition, these surveys were typically conducted at a single point in time, and asked individuals to report retrospectively on changes in their effort level. Obviously, such a method can lead to measurement error due to recall problems for respondents. Gallie *et al* (1998) adopt a more nationally representative survey, with the same conclusion that there was a process of labour intensification, in terms of 'work pressure' over the period 1987-1992, although their research again adopts the recall method. The evidence presented below benefits from being based on surveys at two points in time, in which identical effort questions are asked. Responses in the two time periods can thus be compared, providing a picture of effort changes over time, without requiring survey respondents to accurately recall effort levels from a number of years previous. These data will be described in more detail, following an outline of the theoretical arguments for why there may have been a process of labour intensification in Europe in the 1990s.

3. Theory Review

Effort levels could be modelled in principle within a competitive or a bargainng framework, and may, but need not be, the outcome of an efficiency wage model. Hence, changing effort could be attributed to a range of factors emphasised in the various extant labour market models. To simplify, it is convenient to divide the factors that can influence an individual's effort choice into pressures and incentives to work hard.

Pressure may be placed on employees to work harder by firms facing increased competition. One such source of competitive pressures is likely to come from overseas trade, as the world economy becomes increasingly global. Trade between the original industrialised countries has increased, as trade barriers have fallen and trade agreements have been reached, for example between the European Union countries considered in this paper. In addition, trade with the newly developed countries has also risen (see OECD, 1997), as these countries have increasingly turned to the manufacture of labour intensive goods to sell on the world market, given their comparative advantage in terms of lower labour costs, and the rising proliferation of technical knowledge throughout the world. Faced with such pressures, firms need to raise productivity to maintain market share, and increased work effort is one method of raising the productivity of labour. We would, therefore, expect effort to have risen more, where international trade has increased the most.

An alternative source of increased work pressure may be the introduction of new technology, and in particular computerisation. It is hypothesised that this process can lead to the intensification of work effort, through the creation of a more efficient workplace, through the monitoring opportunities afforded management, and finally through the straightforward effect of making jobs more demanding. Computerised technology can make the whole production process more efficient, for example through optimal timing for the ordering and delivering of inputs, the identification and quick solution of problems in production, such as bottlenecks or machinery failure, and accurate stock handling. The result can be a constant stream of work for employees, with fewer periods of stoppage and wasted time. Green (2000) characterises this speed up of work as a process of "effort-biased technological change" in which the relative productivity of high effort workers is enhanced. Moreover, just as computerised control of production leads to more control over the speed of employees' work, so a further potential effect of computers is to raise employers' ability to monitor instances of 'shirking'.

Such examples of the labour intensification effects of new technology are not restricted to the manufacturing sector, but can equally be found in services. For example, Fernie and Metcalf's (1998) case study of call centres describes how computer technology allows management to distribute incoming calls to employees automatically, so that as soon as an employee finishes one call, another is immediately routed to him or her ('an unstoppable telephonic conveyor belt'). There is no time wasted at all waiting for the next call to be processed. In addition, the exact amount of time that an employee is logged out of the system and is unavailable to take calls can be perfectly monitored. As Fernie and Metcalf describe, 'the advertising brochure for a popular call centre software package is boldly titled "Total Control Made Easy".' The final explanation for an intensification effect of computerisation, is simply that such new technologies make work more demanding. Previous evidence of such an effect is supplied by Gallie and White (1993), who use data from their wide-ranging survey of workplaces to show that 'the massive increase in the use of new technology....is closely related to increased skill requirements.' Given that they also find

a strong positive link between skill requirements and self-reported effort[2], their analysis suggests that effort levels will have increased most where new technologies have been introduced.

The effects of the pressures on individuals to exert more effort, from increased international competition or the introduction of computerised technologies, may be mitigated to some extent, if individuals are protected from such pressures. For example, employee rights laid down by legislation, or negotiated by trade unions, may reduce the demands that management can place on their workforce. Thus, if dismissal is made difficult by the law, or by union procedures, this may reduce management's ability to use the dismissal threat as a means of obtaining more effort from their workforce, when competitive pressures are increased. Therefore, we might expect employment protection legislation, and the change in the level of unionisation, to be negatively related to changes in effort. Similarly, competitive pressures, particularly from international trade, are likely to be minimal in the non-profit sector, and so the expansion of the private sector may be positively related to the change in effort levels.

Turning to the incentives available for employees to work harder, the most obvious reward available is financial. It has been suggested by Bell and Freeman (1994) and Gregg (1994) that rising wage inequality has been responsible for the increased number of hours worked by those at the top of the hours distribution in the US and the UK respectively. If the wage distribution becomes wider, the financial gains to be made in absolute terms from moving up this distribution are greater, and so individuals work longer hours in an attempt to further their careers and move up the pay ladder. Exactly the same argument can be applied to work effort, and so we should expect to see effort increasing the most where wage inequality has significantly widened. Another source of increased incentives to work hard could be the competitive pressures referred to above. If effort-biased technological change means that high effort workers become more productive, employers may increase the (short- and long- term) rewards for high effort in order to attract more hard working employees.

4. Data Description and Estimation

The data for the following analysis are taken from the two European Surveys on Working Conditions (ESWC), in 1991 and 1996. Identical questionnaires were administered to approximately 2000 individuals in each of the member countries of the European Union. We use data on the twelve existing members in 1991 (with Germany split into east and west). The key part of the questionnaire for our purposes is concerned with working conditions, defined broadly to include effects of the job on individuals, as well as physical surroundings. Two questions relate to the effort expended at work, namely 'How often does your main job involve working at very high speed?' and 'How often does your main job involve working to tight deadlines?' The answers to both of these questions were coded on a similar scale, ranging from 7 down to 1. The numbers represented the following possible responses: 7 'all of the time', 6 'almost all of the time', 5 'around three-quarters of the time', 4 'around half of the time', 3 'around one-quarter of the time', 2 'almost never' and 1 'never'. To create the effort variable used in the analysis, we took the simple average of these two variables, so that our effort variable was also measured on

[2] Of those respondents who had experienced an increase in necessary skill levels at work, 76% also reported an increase in effort, whereas this figure was only 35% among respondents whose skill levels had remained unchanged.

a scale of 1-7, with the possibility of half-point values[3].

In the 1996 survey, there were a number of other variables that one would expect to be correlated with our measure of effort, if it is indeed capturing the degree of labour intensity. As a validation exercise, we therefore examined the relationships between effort and each of these variables. First, there is a question asking the respondents 'on the whole, is your pace of work dependent or not on....?' There follow five options, the work done by colleagues, direct demands from customers *etc*, production norms, machine speed and direct control of a boss, to which the respondent can answer yes or no in each case. The categories are not mutually exclusive. We simply summed the number of positive answers the respondent gave, to give an index of the number of pressures facing each employee, with values from 0 to 5. We expected employees under more pressure to exert more effort, and this was indeed the case; the Spearman rank order correlation coefficient between our effort variable and this 'pressure' variable being 0.29, which is significant at the 1% level. Another validating question asked whether respondents had enough time to get the job done. It seems reasonable to expect that employees with insufficient time will have to work harder within the time that they have. The data show this to be the case, with the Spearman rank order correlation coefficient between our effort variable and a dummy variable indicating insufficient time being 0.27, which is again significant at the 1% level. Finally, it was mentioned above that increased effort can have detrimental effects on an individual's health, while safety may also be jeopardised. We calculated the Spearman rank order correlation coefficient between our effort variable and a dummy variable indicating respondents who report that their health and safety are at risk because of their work, and again obtained a significant result, at the 1% level (r=0.19). On the basis of these results, we proceeded on the basis that our effort variable contains some information concerning work intensity, and examined its relationship with the explanatory variables of interest.

To investigate the hypotheses outlined in the previous section, our estimating model takes the following form:

$$E_{it} = \alpha_0 + \alpha_1 TR_{it} + \alpha_2 COMP_{it} + \alpha_3 PROT_{it} + \alpha_4 REW_{it} + \sum_j \delta_j D_{ij}$$

$$+ \sum_j \gamma_j D_j . Y96 + \lambda Y96 + \beta X_{it} \qquad for\ t = 1991, 1996 \qquad (1)$$

where E_{it} is a latent variable measuring work effort, *TR* is a measure of competitive pressures from trade, *COMP* measures the frequency of computer usage at work, *PROT* measures the degree of worker protection, *REW* is a measure of the rewards for high effort, the D_j are country dummies and *Y96* a year dummy. X_i is a vector of other variables that arguably may have an effect on effort, namely gender, age, years of schooling, marital status, hours of work, possibility of choosing one's own speed of work, company size, private or public sector, industry and occupation.

The methodology adopted was to estimate (1) using ordered probit, with our aggregate effort variable as the dependent variable. We initially pooled the data across both countries and the two years of the ESWC, including a year dummy and country dummy variables, and interactions

[3] We repeated all of the analysis that follows for the two variables separately, and while there were small differences, none of the substantive conclusions of the paper were changed.

between the two, in the estimated equation. As explained above, because of the possible existence of diverse cultural effort norms in the different countries that would affect the way respondents answered the questions, we are not particularly interested in how the level of responses to the effort questions differ across countries (the $\$_j$). Rather we focus on the coefficients on the interaction terms between the country and year dummies (the $(_j$), which indicate how effort has changed over time, relative to the change in the reference country. Thus we assume that effort norms have remained constant in each country over the five years in question, making such a comparison valid. We then attempt to explain the change in effort through the explanatory variables listed above. We regard (1) as a reduced form, resulting from the range of supply side and demand side factors. On the basis of the previous discussion, it is expected that:

$$"_1 > 0, \ "_2 > 0, \ "_3 < 0, \ "_4 > 0$$

We discuss the other controls below along with the results.

Unfortunately, at the individual level there are no data on *TR*, *PROT* or *REW*. However, it is possible to obtain data at the national level across most of our countries. Accordingly, we average (1) across individuals in each country. We then eliminate the fixed effects by taking first differences and estimating the change in effort level between 1991 and 1996. For this purpose, we proxy *TR* by trade density, *PROT* alternatively by trade union density and by an index of employment protective legislation, and *REW* by the level of wage inequality. The change in computer usage was measured by taking the average reported change in the frequency of computer use in each country in the ESWC. For the other variables, it was necessary to obtain data from national sources. Full details are provided in the data appendix.

5. Findings

5.1 Descriptive statistics

Table 1 shows how individuals responded to the two questions used to create the effort variable, pooling the data across all countries. In this, and all following tables, only employees of working age are considered. The results show that there has been an increase in the numbers of workers who report frequently working at very high speed or to tight deadlines over time, and thus reveal the degree of labour intensification in 1990s Europe[4]. In 1991, 18% of employees reported working at very high speed either all of the time, or almost all of the time. By 1996, this figure had risen to 25%. Thus 1 in 4 European workers in 1996 consider that they are working at very high speed virtually all of their working time. At the bottom end, the proportion reporting that they never work at very high speed has fallen from 35% to 30% between 1991 and 1996, with a small decrease of less than one percentage point in the proportion reporting 'almost never.' Thus, the number of employees being exposed to very fast work rates is increasing in Europe. The change

[4] The changes in the distributions of both variables between the two years are statistically significant, the P^2 statistics being 196 and 68, for the 'high speed' and 'tight deadlines' variables, respectively.

in the responses to the 'tight deadlines' question shows a similar, if slightly less marked pattern. The proportion reporting that they always or almost always work to tight deadlines has risen from 25% to 29% over the five year period, while the proportion reporting that they never or almost never face such deadlines has fallen from 49% to 44% over the same period.

Table 2 analyses whether the process of labour intensification has occurred in all of the European Union countries. In this, and all subsequent tables, the average of the 'high speed' score and the 'tight deadlines' score is used, and is referred to simply as effort. The results report the average score for the effort variable, on the 1-7 scale. For reasons described above, we focus on the change in effort, rather than the difference in effort levels across countries. The results show that while effort has increased in every single country between 1991 and 1996, the degree of change differs across countries. The intensification process has been strongest in Great Britain, where effort scores have on average increased by more than one-half a point, on the effort scale. Britain is followed in the 'league table' by Ireland and France, in both of which the change in the effort level has been just under one-half a point. At the bottom end, Greece, Denmark and western Germany have witnessed only very small increases in average effort.

One possibility is that the differences in effort changes across countries are related to the state of the business cycle in each country. It could be argued that effort demands will be greater when an economy is moving into a boom rather than into a slump. Thus for example, the relative positions of Great Britain and western Germany could be explained by the relative performances of the two economies between 1991 and 1996. However, while this argument may hold with reference to those two countries, the story does not appear to fit other countries. For example, the economies of western Germany and France have performed similarly in the 1990s, and yet the increase in effort in France has been large, while that in western Germany has been very small. We investigated the proposition formally, proxying the change in national performance with the change in each country's unemployment rate. The correlation between this variable and the change in effort was negative, but statistically insignificant ($r = -0.28$, p-value=0.37). While it was true that the countries where unemployment had fallen between 1991 and 1996 saw a greater change in effort than the countries where unemployment had risen (0.38 units versus 0.25 units, on average), the difference was statistically insignificant ($t=1.19$, p-value=0.26).[5]

Table 3 tabulates the change in effort by aggregated industry and occupation, to determine in which sectors of the economy effort has been changing most. With respect to industry, the differences in the changes in effort are not large, with the exception of agriculture where effort levels barely changed. The largest changes in effort are found in the distribution and business and finance sectors. The occupation data are more revealing about the changes that have been taking place. It seems that non-manual workers have seen the greatest increase in their effort levels, particularly at a junior level. Taken together, the results in Table 3 suggest that effort has been rising most for office rather than shopfloor employees, with the changes occurring within most industries.

[5] To ensure that changes in national performance were not driving any of our results, we included the change in unemployment as an additional control variable in the country-level regressions described below. However, none of the results were qualitatively different from those presented in Table 6.

5.2 Econometric results

5.2.1 Individual-level estimates

Table 4 begins the more formal analysis of effort changes over time. The table pools the data across all countries and both time periods. In column 1, only a dummy variable for observations occurring in 1996 is included in the estimated ordered probit equation. The statistically significant positive coefficient on this variable supports the hypothesis that there has been an increase in effort levels, on average, in Europe in the 1990s, as was found in the raw data in Table 1.

Column 2 introduces dummy variables for the twelve countries, and the interaction terms between these variables and the year dummy. The omitted country is Great Britain, and thus the coefficient on the year dummy variable measures the change in effort in that country between 1991 and 1996. Since this increase is greater than the European average, as was seen in Table 2, the coefficient on the year dummy variable is significantly higher in column 2 than in column 1. Concentrating on the relative change in effort across countries, rather than international differences in the levels, the coefficients on the interaction terms between the year and country dummies reveal the change in effort over the five years in each country, relative to the change in Great Britain. Since all of these coefficients are negative, we observe that the process of labour intensification has occurred to the greatest degree in Great Britain, as was found earlier in Table 2. In five countries, Denmark, west Germany, east Germany, Greece and Spain, the increase in effort is statistically significantly lower than the increase in Great Britain.[6]

Column 3 adds control variables for individual and firm characteristics. The aim is to try and explain some of the changes in average effort levels through these explanatory variables. The coefficient on the year dummy variable is, however, virtually unchanged between columns 2 and 3, suggesting that if all of the control variables had remained constant, we would still observe virtually the same increase in effort in Great Britain that we actually observe. Similarly, the coefficients on the country-year dummy interactions are not affected to any large degree by the inclusion of the control variables, and so again, even if all our variables had remained constant over time, we would still observe significant differences in effort changes between the countries. Indeed, some of the interaction coefficients actually increase, and there are two more that are statistically significant, at the 10% level, in addition to the five observed in column 2[7]. Thus, far from explaining the differences in the labour intensification process across countries, movements in the control variables in some cases work against the unknown overriding cause of the differences in intensification, and reduce these differences to a value smaller than they otherwise would have been. It does not, therefore, seem to be the case that changes in the characteristics of individuals and firms towards those associated with higher effort can explain why labour is used increasingly intensively.

To test more formally whether the control variables can explain the changes in effort, we performed likelihood ratio tests of the joint explanatory power of the year dummy and country-year

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[6] The actual predicted change in effort in each country, rather than the relative change compared to Great Britain, can be found by adding the coefficient on each country's interaction term to the 1996 intercept dummy.

[7] The changes in effort in Italy and the Netherlands are now statistically significantly lower than in Great Britain, once the control variables are included.

interactions, first without the control variables in the equation, and then with the controls included. If the control variables can explain why effort has increased, and why by more in some countries than in others, we would expect that the year dummy and country-year interactions would have no explanatory power when the controls are included. This is not the case, however, as suggested by the discussion above. Although the P^2 statistic for the likelihood ratio test of the joint explanatory power of the year dummy and the country-year interactions falls following the inclusion of the control variables, from 195 to 148, the latter statistic is still highly statistically significant. There remains a large component of the changes in effort over time that cannot be explained through our control variables.

The final column in Table 4 adds a dummy variable representing individuals who claim to be able to control their pace of work. It was decided not to include this variable at an earlier stage because of its potentially endogenous nature; the decision to provide employees with such autonomy may be a function of other variables in the analysis, including their effort level. In fact the inclusion of this variable does not affect the estimated coefficients to any significant degree. The coefficient on the choice variable itself is negative and highly statistically significant. If an individual can choose their own pace of work, they are less likely to be affected by the pressures to work harder, described above. Thus, other things constant, such individuals report lower effort levels. Note that this variable does not explain the labour intensification process. The proportion of employees with such autonomy has been growing during the 1990s, and so other things equal, we should have observed a decline in effort. Holding autonomy constant, we therefore observe an even greater rise in effort, as revealed by the larger coefficient on the year dummy variable in column 4.

The analysis in Table 4 pools the data across all countries, constraining the effects of the explanatory variables to be necessarily the same in each country. We therefore also re-estimated the ordered probit equations for each country, and summarise the results in Table 5. The first two columns report the coefficients on the year dummy variable when it is entered on its own, and when all of the control variables are included (ie the equivalent specifications of column 1 and column 3 in Table 4). The results show that in the majority of countries, the coefficient does not change to any great degree when the control variables are added, and so these control variables cannot explain the rise in effort that has been observed in each country. Possible exceptions to this general rule, where the year dummy coefficient does decline by an appreciable amount, are Belgium, east Germany and Italy. In these countries at least, part of the increase in effort may be explained by shifts in the characteristics of individuals and firms towards those associated with higher effort.

Turning to these characteristics, the coefficients on the control variables can tell us about some of the factors that explain the level of effort within any country, however, if not the change. For example, the frequency of computer use variable, measured on a 1-7 scale with the same possible responses as the effort variable, attracts a coefficient that is positive and highly statistically significant in every country, as well as in the pooled sample (Table 4)[8]. Thus, workers who use computers more frequently also exert high levels of effort more frequently. This is consistent with the hypothesis outlined above, that the introduction of computer technology can be used to increase the pressure on employees to work hard, either through improved control over workflows thereby enabling a greater pace of work, or by improving monitoring possibilities, or

[8] The coefficient on the computer use variable has the highest Z-statistic in the estimated equations, in every country except Belgium and France.

simply by making the work more demanding. Far from being a liberating force in the workplace, making everyone's work and life easier, computer technology seems to be associated with the intensification of labour.

Considering the personal characteristics of individuals, gender and marital status do not appear to be strongly associated with effort. There are few statistically significant effects of these variables in the country equations, and in the pooled equation, they have no effect. Age has a statistically significant association in four countries, with older employees being less likely to exert high levels of effort, in each case. This is also the outcome when the data are pooled across all countries. Such an effect can be explained in terms of incentives, by taking a lifetime view. If one of the motivations to increase work levels is to move up the income distribution, then older workers will have fewer years of work at a new higher level of income, and so a lower present value attached to their 'investment' in higher effort. Note that the countries where the age coefficient is statistically significant are Great Britain, Ireland, the Netherlands and Spain, all of which have above average levels of wage inequality, suggesting that the benefits to the young of exerting more effort will be higher in these countries.

The education variables measure the age at which individuals finished full-time education, grouped into three categories, with the youngest age group excluded from the equation. Where the coefficients on these variables achieve statistical significance (Belgium, France, Greece and Portugal) they suggest that those with more education exert less effort. A simple human capital explanation might suffice to account for this finding: perhaps the well-educated use their more favourable labour market position to accept only jobs where the pressures to exert effort are not high. Note, however, that in the pooled equation, the effort-education relationship appears to be U-shaped (also in west Germany, amongst the individual country regressions) with those individuals with intermediate levels of education exerting the lowest effort level. This finding suggests that there may also be a link between education level and the disutility associated with work – a possibility that could not be examined with this data.

Together with the frequency of computer use, the variable with the most consistent effect is hours of work, which also attracts a statistically significant positive coefficient in every country. We interpret this result as saying that where pressures to work harder occur, these manifest themselves in both longer hours, and higher effort levels within these hours. By including hours of work in the estimated equations, the effects of all other variables can be interpreted, holding hours of work constant, so that the pure effect on effort can be observed.

Turning to characteristics of the employers, company size is positively and statistically significantly related to effort in every country except Italy and the Netherlands. This effect is not easy to interpret. Workplace size has often been used as a proxy for the ease of supervision, on the assumption that supervision is more difficult in large workplaces. Then, we would expect to observe lower effort levels in larger workplaces. Note that the variable used here, however, measures company rather than workplace size, that is the number of individuals employed across all workplaces in the respondent's company. The link between company size and supervision is far less obvious. We prefer to see company size as a control variable for the type of work undertaken, with no particular interpretation placed on it.

Whether the respondent's company is in the public or private sector has an important effect on effort, with private sector workers reporting statistically significantly higher levels of effort in seven countries. This is consistent with the idea that employees in the private sector feel the full force of the pressures to exert more effort, when these occur. Public sector employers however are not driven by the profit motive, and do not need to meet increased competition from

competitors, at home or abroad. The intensification of labour has, therefore, not occurred in the public sector, with employees being protected from external pressures. Interestingly, the exception to this rule is Great Britain, where public sector workers actually report higher levels of effort. This can be linked to the 'Thatcherisation' of the public sector in Britain during the 1980s, which involved, as far as possible, installing the ideas of the free market and competition into the public sector. Public servants in Britain therefore receive no protection from competitive forces.

Finally, we do not report or offer an interpretation of the coefficients on the industry and occupation variables, as these are likely to be strongly influenced by the type of work performed. We therefore would not like to say that one group of individuals work harder than another group, if they are undertaking completely different types of work. We include the variables in the estimated equation, however, to control for such differences, allowing us to interpret the coefficients on the remaining variables, holding type of work constant.

Summarising the results so far, there has been an increase in work effort, to a greater or lesser extent, in all of the countries in the European Union in the 1990s. While we have identified a number of characteristics of individuals and firms that are associated with effort, we have not managed to explain why effort has risen, in terms of changes in these characteristics.

5.2.2 Country-level estimates

One reason for the failure to explain effort change may be that the theories of effort determination outlined above relate to factors that could not be measured with the individual level data. Therefore, we also conducted some additional analysis, with the unit of observation being an individual country. We used the ESWC data to measure the average level of self-reported effort in 1991 and 1996, and take the change as the dependent variable. The explanatory variables are the change in the average frequency of computer use, also measured by the ESWC data, the change in the value of each country's trade as a proportion of that country's GDP, the change in the trade union density, and the level of employment protection legislation in place in each country. It was decided to initially regress the change in effort against each one of these variables in turn, because of the low number of degrees of freedom involved. The degrees of freedom were lowered further by the removal of Germany from the country level analysis. This was due to the problem of Germany being separated into east and west in the ESWC data, while most of the data available for the explanatory variables were available only for unified Germany.

The results of the country level analysis are displayed in Table 6. Column 1 shows a positive relationship between the change in the frequency of computer use, and the change in effort, although the effect is not statistically significant. The relationship is graphed in Figure 1. As was found in the individual level data, therefore, the increased use of computer technology in the 1990s does not seem to explain the rise in work effort, despite there being a strong relationship between the levels of these two variables. There appears to be a relationship between the changes in these variables in some countries, for example, Great Britain and the Netherlands have both witnessed a large increase in the frequency of computer use and in effort, while Denmark and Greece have both experienced a fall in the frequency of computer use, and low increases in the level of effort. However, there are exceptions to the rule, resulting in the overall insignificant statistical relationship. For example, the frequency of computer use appears to have been falling in France, yet this country shows a very strong increase in effort.

That computer use forms part of the story of changing effort levels is however suggested by the occupation-specific effort changes seen in Table 3. In particular, the occupation that has

provided the largest increase in effort (junior non-manual) has also seen the greatest increase in computer use. The manual occupations are the least likely to have increased their usage of computers, and they have also seen the lowest increases in effort (ignoring agriculture). To investigate this issue further we calculated the average effort change and the average change in computer use in each of 78 country-occupation cells (13 countries x 6 occupations). We then regressed the change in effort onto the change in computer use using these 78 data points, and obtained a positive and statistically significant coefficient. Thus, even though changes in computer use cannot explain changes in effort at the national level, when we move to within-occupation effort changes, computer use seems to be an important determinant. We performed a similar analysis of effort and computer use changes with country-industry cell data. The coefficient on the computer use variable in this regression was highly statistically insignificant, however. The changes in work procedures leading to more effort, therefore, seem to be occurring for particular occupations (namely non-manual occupations) *within* industries, rather than *between* industries with some industries expanding and some contracting.

Column 2 of Table 6 investigates the relationship between the change in total trade as a proportion of GDP and the change in effort[9]. Figure 2 offers a graphical representation of this relationship. The variables are positively related, as predicted by the theory outlined above, although the effect is again statistically insignificant. The graph shows a wide dispersion of the data points around the estimated regression line. It would appear that the pressures on business from increased foreign competition has not led to large demands for more effort.

Column 3 and Figure 3 show the effect of the change in union density on the change in effort. In this case, the relationship is very strong, and is significant at the 1% significance level[10]. The countries have virtually the same rank order with respect to both variables. This would suggest that the declining power of trade unions in some European countries, for example Great Britain, has been an important factor behind the intensification of labour. Without the protection of unions, employees have been increasingly at the mercy of employers' demands for greater effort from them.

Employment protection legislation, on the other hand, does not seem to be related to changes in effort in the 1990s, as revealed by column 4 in Table 6. The coefficient on the protection index, though negative as predicted, is highly insignificant in statistical terms. Figure 4 reveals virtually a random scatter diagram, when effort changes are graphed against the protection index.

A further theory of effort determination developed above, related changes in effort to changes in income inequality. It has proved difficult to obtain data on income inequality for the relevant period, and so far we only have observations for six of our countries. Figure 5 graphs the relationship, for these six observations. Within this very limited sample at least, there appears to

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[9] No trade data for Luxembourg and Greece could be obtained.

[10] The number of observations falls to 9, as Greece and Luxembourg are excluded. We have no union density data for Luxembourg. With respect to Greece, density data are not widely available, and the estimates that have been made appear unreliable and differ signficantly. However, there seems to be agreement that density rates have fallen in the 1990s (for example, see Ioannou, 1999). Together with a small increase in effort, this fact implies that the density-effort relationship revealed in Figure 3 does not hold with respect to Greece. We therefore omit Greece the equation in column 3, on the grounds that such an outlier can seriously disturb a statistical relationship based on such a small sample, as well as on the grounds of the unreliable nature of the data. Note that if Greece is included, however, the relationship is seriously weakened.

be no relationship between changes in effort and changes in income inequality.

The final two columns in Table 6 attempt to estimate multivariate models, within the narrow confines allowed by such a small sample. In column 5, the two 'pressure' variables, the change in the frequency of computer use and the change in the real dollar value of a country's international trade, are included in the estimated equation. Neither attracts a statistically significant coefficient, however. Column 6 adds the change in trade union density, and this variable maintains its statistically significant effect, at the 5% significance level. The reduced level of protection available to employees from pressures to work harder, therefore, appears to be the key explanation for the variation across countries in the rise of effort levels in the 1990s. However, increased trade competition and declining union density may be intimately connected, and the unavoidable multi-collinearity evident in these findings precludes us from ruling out trade competition as an important exogenous factor.

In all these estimates, the fact that the constant term is positive and highly significant indicates an upward shift in effort that is not otherwise explained by the pressures and incentives we have been able to measure. Nevertheless, the explanatory variables do perform a good job of explaining why effort intensification has varied across countries. To take an example, the effort index rose by 0.56 in Britain but only by 0.19 in Spain, a difference of 0.37. The within-sample prediction from column 6 estimates gives a figure of 0.40. In these data, the strongest factor associated with Britain's faster work intensification than that of the rest of Europe is Britain's large decline in trade union density.

6. Conclusion

This paper has used data from the European Survey on Working Conditions to examine the proposition that there has been an intensification of labour in Europe in the 1990s. Such an increase would have implications for the utility levels of workers, and also the sustainability of productivity gains that have been achieved.

Asking identical questions at two points in time, in 1991 and 1996, the surveys reveal that there has indeed been an increase in effort between these two dates, in terms of speed of work and the necessity of working to tight deadlines. The increase has been largest in Great Britain, and smallest in western Germany. We have presented evidence that high effort levels are associated with the demands of new technology (as previous writers have argued), with high levels of competitive pressure, and with low levels of worker protection. Thus individuals who frequently use computer technology are much more likely to report high effort levels. The impact of competitive pressure is indicated by the fact that private sector employees work harder than those in the public sector (with the exception of Britain). The force of protection is supported strongly at the national level, in that variations in the decline of trade density are highly correlated with increases in effort. But government's role, through protective legislation, appears to be weak. Just as it is found that legislation has relatively little effect on aggregate unemployment (OECD, 1999), so we have found no tangible impact of protective employment legislation on work effort.

Nevertheless, there remains a significant rise in effort levels, in most of the countries we examined, that cannot be accounted for by any or all of the available explanatory variables. We have identified protection from increased pressure as a source of differences in effort changes across countries, but have not identified the source of the increased pressure in the 1990s. We hypothesise that it is at least in part related to changing work procedures, and point to the result

above that effort is rising fastest amongst workers in particular occupations (namely non-manual occupations) within all industries. Since this group has also seen the largest increase in computer usage, this gives further credence to the hypothesis that changing work methods are responsible for an increased pressure to work hard. At a minimum, this relationship deserves further examination. Given the importance of effort as an element of economic welfare, and of effort changes as a component of productivity growth, we assert the value of continuing this series of surveys on working conditions and including identical questions on effort. Only through such a methodology can we track the effects of changing European labour markets on work effort.

Table 1: The Change in the Distribution of Responses to the Two Effort Questions Over Time (%) All Countries Pooled

	working at very high speed		working to tight deadlines	
	1991	1996	1991	1996
all of the time	7.6	11.6	11.0	15.2
almost all of the time	10.7	13.3	13.7	13.4
about 3/4 of the time	5.2	5.8	5.3	6.1
about 1/2 of the time	11.9	11.6	9.3	9.9
about 1/4 of the time	12.4	11.1	11.4	11.8
almost never	17.2	16.5	15.4	13.8
never	35.1	30.0	33.9	29.8
Total	100.0	100.0	100.0	100.0

Table 2: The Change in Average Effort Levels, By Country

Country	1991	1996	change (1996 - 1991)
Great Britain	3.35	3.91	0.56
Ireland	2.90	3.38	0.48
France	2.72	3.20	0.48
Italy	2.45	2.87	0.42
Netherlands	3.18	3.60	0.42
Portugal	2.86	3.22	0.36
east Germany	3.66	3.89	0.33
Belgium	2.64	2.89	0.25
Spain	2.75	2.94	0.19
Luxembourg	2.64	2.81	0.17
Greece	3.51	3.58	0.07
Denmark	3.44	3.50	0.06
west Germany	3.44	3.47	0.03

Note: Average effort is the average score on the 'high speed' and 'tight deadlines' questions. It is thus measured on a scale of 1-7.

Table 3: The Change in Average Effort Levels, By Industry and Occupation

	change in effort (1996-1991)
industry	
agriculture	0.017
manufacturing/mining	0.358
construction	0.242
distribution	0.548
transport/communications	0.368
business/finance	0.510
other services	0.429
occupation	
agriculture	0.009
senior non-manual	0.379
junior non-manual	0.731
services/sales	0.629
skilled manual	0.253
elementary occupations	0.203

Note: Average effort is the average score on the 'high speed' and 'tight deadlines' questions. It is thus measured on a scale of 1-7.

Table 4: The Influences on Work Effort

	1	2	3	4
year = 1996	0.189 (0.016)***	0.317 (0.035)***	0.301 (0.036)***	0.336 (0.036)***
Belgium		-0.472 (0.086)***	-0.392 (0.087)***	-0.422 (0.087)***
Denmark		0.074 (0.080)	0.146 (0.081)*	0.144 (0.081)*
France		-0.361 (0.039)***	-0.322 (0.040)***	-0.367 (0.040)***
west Germany		0.043 (0.035)	0.077 (0.036)**	0.009 (0.036)
east Germany		0.187 (0.050)***	0.271 (0.052)***	0.215 (0.052)***
Greece		0.082 (0.089)	0.218 (0.090)**	0.134 (0.090)
Ireland		-0.251 (0.138)*	-0.208 (0.139)	-0.218 (0.139)
Italy		-0.554 (0.042)***	-0.453 (0.044)***	-0.476 (0.044)***
Luxembourg		-0.461 (0.338)	-0.446 (0.340)	-0.485 (0.340)
Netherlands		-0.037 (0.064)	0.029 (0.065)	0.044 (0.065)
Portugal		-0.304 (0.079)***	-0.342 (0.080)***	-0.389 (0.080)***
Spain		-0.393 (0.049)***	-0.419 (0.050)***	-0.473 (0.050)***
Belgium*1996		-0.110 (0.113)	-0.140 (0.113)	-0.134 (0.113)
Denmark*1996		-0.287 (0.111)***	-0.245 (0.112)**	-0.242 (0.112)**
France*1996		-0.071 (0.053)	-0.044 (0.053)	-0.047 (0.053)
west Germany*1996		-0.277 (0.047)***	-0.266 (0.048)***	-0.258 (0.048)***
east Germany*1996		-0.197 (0.075)***	-0.188 (0.076)**	-0.195 (0.076)***
Greece*1996		-0.271 (0.121)**	-0.297 (0.121)**	-0.309 (0.121)**
Ireland*1996		-0.073 (0.189)	-0.024 (0.190)	-0.054 (0.190)
Italy*1996		-0.023 (0.059)	-0.097 (0.059)*	-0.100 (0.059)*
Luxembourg*1996		-0.194 (0.483)	-0.188 (0.486)	-0.201 (0.486)
Netherlands*1996		-0.108 (0.083)	-0.147 (0.083)*	-0.173 (0.083)**
Portugal*1996		-0.056 (0.106)	-0.044 (0.107)	-0.021 (0.107)
Spain*1996		-0.134 (0.067)**	-0.140 (0.068)**	-0.149 (0.068)**
frequency of computer use			0.092 (0.004)***	0.098 (0.004)***
female			0.008 (0.019)	-0.005 (0.019)
age			-0.004 (0.001)***	-0.004 (0.001)***
finish education age 16-19			-0.047 (0.022)**	-0.027 (0.022)
finish education age 20+			-0.027 (0.027)	-0.002 (0.027)
married			0.007 (0.018)	0.015 (0.018)
hours of work = 36- 40			0.124 (0.022)***	0.120 (0.022)***
hours of work = 40+			0.464 (0.026)***	0.473 (0.026)***
10-49 employees			0.185 (0.024)***	0.176 (0.024)***
50-499 employees			0.186 (0.024)***	0.167 (0.024)***
500+ employees			0.244 (0.025)***	0.219 (0.025)***
private sector			0.125 (0.021)***	0.123 (0.021)***
choose speed of work				-0.368 (0.017)***
industry	no	no	yes	yes
occupation	no	no	yes	yes
number of observations	17236	17236	17236	17236
log likelihood	-41873	-41485	-40537	-40311

Note: estimation is by ordered probit. Standard errors in paratheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

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