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**Workplace Performance:  
A Comparison of Subjective and Objective Measures in the  
2004 Workplace Employment Relations Survey**

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# **Workplace Performance: A Comparison of Subjective and Objective Measures in the 2004 Workplace Employment Relations Survey**

**John Forth\* and Robert McNabb\*\***

## **Abstract**

Understanding what determines workplace performance is important for a variety of reasons. In the first place, it can inform the debate about the UK's low productivity growth. It also enables researchers to determine the efficacy of different organisational practices, policies and payment systems. In this paper we examine not the determinants of performance but how it is measured. Specifically, we assess the alternative measures of productivity and profitability that are available in the 2004 Workplace Employment Relations Survey (WERS). Previous WERS have been an important source of data in research into workplace performance. However, the subjective nature of the performance measures available in WERS prior to 2004 has attracted criticism. In the 2004 WERS, data was again collected on the subjective measure but, in addition, objective data on profitability and productivity was also collected. This allows a comparison to be made between the two types of measures. A number of validity tests are undertaken and the main conclusion is that subjective and objective measures of performance are weakly equivalent but that differences are also evident. Our findings suggest that it would be prudent to give most weight to results supported by both types of measure.

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We also thank the WERS 2004 Sponsors (DTI, ACAS, ESRC and PSI) as the originators of the WERS 2004 data, and the ONS as the originators of the Annual Respondents Database and the Annual Business Inquiry data. The ABI data provided by ONS are Crown copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

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## 1. Introduction

It is well established that productivity levels in Britain significantly lag behind those found in many of its main competitors in continental Europe as well as in the US. This, coupled with the fact that productivity growth is a principal source of economic growth and economic well-being, has put understanding the “productivity gap” at the centre of macroeconomic policy formulation as well as prompting a significant amount of academic research (HM Treasury, 1999; Barrell et al, 2000).

Central to the policy debate has been a significant body of literature assessing the contribution at a macro-level of such factors as capital investment, innovation and technological progress (especially in the form of information technology) and the level and range of skills among the British workforce. Additionally, the relative importance of the public and service sectors to overall levels of economic activity in Britain has raised questions about whether poor productivity levels in these sectors have had a dampening effect on the overall performance of the national economy (Vaitilingam, 2004).

More recently, the debate has been extended to consider what is happening at the micro level. One strand of this analysis sets out to establish whether national economic activity has been held back by “a long tail of under-performing companies” (Oulton, 1998) and to identify the characteristics of these companies with the focus primarily on those factors identified as important at the macro-level (see, Crespi, et al, 2006; Disney, et al, 2003; Galindo-Rueda and Haskel, 2005).

A second body of analysis, however, has focused on the way different types of human resource management, employment practices and compensation systems impact upon organisational performance. Much of this work arises not from a desire to understand the micro-level determinants of national productivity, per se, but rather from the point of view of establishing the efficacy of different organisational practices, policies and payment systems. The range of subjects studied have included the impact of union representation, performance-related pay, high-involvement practices, and equal opportunities, diversity and family-friendly policies (see, Bryson and Wilkinson, 2002; Conyon and Freeman, 2004; McNabb and Whitfield, 2000; Bryson et al, 2005, and Dex et al, 2001).

Of course, a crucial element for this analysis is the availability of information on workplace practices and relevant contextual variables, on the one hand, and organisational performance measures, on the other. In this respect, the Workplace Employment Relations Surveys (WERS) (previously, the Workplace Industrial Relations Survey) have proved an invaluable source of data and have been much used in this strand of the performance literature (see Millward et al, 2006).

Despite the extensive use of WERS in human resource management, industrial relations and personnel economics, some commentators have questioned its value on two counts. First, there is the issue of whether the data collected are able to capture the complexity and diversity of human resource management practices and industrial relations at the workplace (McCarthy, 1994) and, second whether the measures of performance that are typically used are accurate indicators of actual performance. The latter point arises because, until WERS 2004, workplace performance was measured via managers’ subjective assessments of relative productivity and relative profitability, which not only opens them up to questions about their reliability but also to the problem of how one interprets measures of relative, as opposed to absolute,

performance.<sup>1</sup> An important feature of WERS 2004, however, is that it provided researchers with objective (accounts-based) measures of productivity and profitability, derived from the Survey's own Financial Performance Questionnaire and also from links made to data contained within the Office for National Statistics' Annual Respondents Database. These data were collected in addition to information based on the subjective performance measures which had appeared in previous surveys in the series.

It is the availability of these alternative measures of establishment performance that is the focus of the present paper. Specifically, the study examines the nature and availability of objective measures of performance in WERS 2004 and their comparability with the subjective information also collected in WERS 2004. This is clearly of some significance since it potentially raises the issue of whether the current wisdom derived from previous analyses of WERS is valid due to the nature of the subjective nature of the performance data used in that work.

## **2. Measuring Organisational Performance**

Before we address the central issue of the paper, it is useful to reflect on the basic underlying question, namely when looking at workplace performance, what are we trying to measure? In many instances, the term performance is used interchangeably with specific measures, such as productivity or profitability, as if they are all equivalents. In fact, they are clearly not.

In the first place, many outcome variables considered are intermediary variables which themselves impact upon other performance measures. One may think here of absenteeism as an intermediary variable determined, *inter alia*, by different compensation systems and employment practices, but which itself impacts upon profitability and productivity. Here we focus on final performance indicators, namely, productivity and profitability, rather than intermediary measures such as labour turnover, absenteeism or product quality.

Second, those variables that one might consider to be final outcome performance measures are not equivalents. The underlying economic fundamentals clearly demonstrate that these have very different determinants and will therefore not necessarily move in the same way. By way of an example, a particular practice that improves productivity may also be costly to monitor and thereby have a negative affect on profitability. It is our view that an analysis that considers both can provide greater insights than when they are taken individually.

The literature on workplace performance suggests that the number of studies and the availability of workplace performance data are both somewhat limited outside of WERS. The aforementioned Annual Respondents Database (ARD) is one source of information that has been used in a number of studies. This is basically a repository for the data collected in the various surveys undertaken by the Office for National Statistics, such as, and most importantly, the Annual Business Inquiry (ABI) (see Barnes and Martin, 2002). The latter provides information, *inter alia*, on gross output, intermediate inputs and employment that can be used to derive a measure of per capita gross value added. The ABI does not, however, contain much information on the sorts of contextual variables found in WERS and there are no data on workplace human resource practices and industrial relations. The ABI has, however, been successfully

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<sup>1</sup> The question text of the subjective measures of productivity and financial performance is reproduced in Appendix A.

linked to other databases to enable some analyses of the correlates of productivity. These include analyses of the relationship between training, skill-levels and productivity, based on matching the ABI with the Employer Skills Survey (Haskel et al, 2003; Galindo-Rueda and Haskel, 2005; Harris and Robinson, 2006) and the New Earnings Survey (Haskel and Pereira, 2002). Analyses of the ABI also cover the relationship between foreign ownership and productivity (Girma and Gorg, 2002; Harris and Robinson, 2004). Nevertheless, the opportunities for further analyses of this type are necessarily limited.

Apart from studies that have used the ABI, there is a body of literature in which data have been collected by the researchers themselves from what are typically small samples of organisations. The information collected includes both subjective measures of relative performance and objective measures of profitability taken from company accounts and/or productivity based on the value of sales per employee (see, for example, Patterson et al, 1997; Michie and Sheehan, 2001, 2003; Guest et al, 2003). These studies have the advantage of having very detailed information on a particular topic that is the focus of the study (such as human resource practices) but are limited in their coverage of other topics. Small samples sizes can also limit the sorts of statistical analysis that is possible.

We have already noted that the WERS data are rich in terms of the range of topics covered and the contextual information collected. However, the subjective nature of the productivity and profitability variables has attracted criticism and, for some, undermines the value of the work that has used these data. The primary concern is that subjective measures will contain errors due to the possibility that the manager who participates in the survey interview (the senior person at the establishment with day-to-day responsibility for personnel or employment relations issues) has only limited information on either or both of the performance variables. Such concerns are seemingly given weight by the fact that a high proportion of respondents report their establishment's productivity and/or performance as being above average and only a small proportion report it to be below average.

Any measurement error is compounded by the fact that in the WERS data the performance variables are measured as categorical variables with only a limited number of categories. This not only means that the subjective measure contains less information than a continuous measure of productivity or profitability but also that measurement error involves a much more significant switch, such as from "average" to "above average". If this measurement error is random, the effect would be to dampen the analyst's ability to explain the variance in performance across workplaces, and to limit the identification of significant associations with workplace practices. But the effect is potentially more serious if there is a consistent positive (or negative) response bias across a range of variables. In other words, respondents may see what is happening in their own establishment in a positive (negative) way, irrespective of the actual state of affairs. This would lead to positive (negative) responses about work practices, etc and positive (negative) responses about performance, introducing a spurious correlation between the two.

The subjective measures may also be criticised because the limited, ordinal nature of the response categories prohibits direct quantification of the impact of any particular practice on workplace performance.

Notwithstanding these concerns, subjective performance measures have a number of significant advantages. From a pragmatic point of view, it is often the case that objective measures of profitability or productivity are simply not available at the level of the establishment. This may be because such information is not collected at

the level of the individual workplace or because, even if it is available, it is commercially sensitive. In contrast, subjective measures tend to attract high response rates. A second advantage of subjective evaluations is that they are less costly to collect, both for the survey administrator and the respondent, as there is no requirement to provide detailed financial breakdowns. Moreover, as Machin and Stewart (1990) note in their discussions of the subjective evaluations provided in the early WERS, even if objective data are available, these also have limitations and can be subject to measurement error, e.g. if there are variations in accounting practices across firms.

### **3. Existing Comparisons of Subjective and Objective Measures of Workplace Performance**

Notwithstanding the advantages and disadvantages of subjective and objective measures of workplace performance, it is also important to note that, although the two are often taken as equivalent, they do measure performance in rather different ways (Wall et al, 2004). In particular, subjective measures are typically framed in terms of the performance of an establishment relative to its comparators where the latter is measured in terms of industry (as in the case of WERS), region or simply in terms of “your competitors”. Second, subjective measures tend to be more broadly defined than objective ones, asking managers to make a judgement either about overall establishment performance or in terms of broadly defined ‘profitability’ or ‘productivity’.

Although there are differences in the way the data are collected, there is an underlying presumption that subjective assessments of establishment performance should correspond reasonably closely with objective data. As a background to the present analysis, the details of three comparison studies are first presented.

#### *(a) Guest, Michie, Conway and Sheehan (2003)*

This study was primarily concerned with establishing the impact of human resource management practices on performance, where performance was measured in terms of labour turnover, productivity and profitability. Detailed information on human resource practices was collected from 610 firms which employed 50 or more people though financial information was available for only 366 of these.

In the present context, the objective measures of interest are a measure of profitability (company profit per employee) and productivity (value of sales per employee). The subjective measures of these two variables correspond to the ones used in WERS, namely, respondents rate their establishment’s productivity/profitability relative to that for their industry on a five-point scale ranging from ‘a lot below average’ through ‘average’ to ‘a lot above average’.

Regression model estimates based on the objective measures of performance indicate that the use of human resource management practices in manufacturing workplaces are associated with higher profitability but they are not statistically correlated with workplace productivity. No impact was found for such practices in terms of higher performance among service sector firms. In contrast, when subjective measures of performance were used, human resource management practices were found to be associated with higher productivity and profitability (full sample) and higher productivity (when manufacturing and service sectors are considered separately).

The differences found when subjective measures are used compared with those based on objective measures of performance lead the authors to reject the hypothesis that the two types of measures are congruent. However, it should be noted that the models are not well specified having very low adjusted R-squared and they contain only a few control variables suggesting significant unobserved heterogeneity.

*(b) Wall, Michie, Patterson, Wood, Sheehan, Clegg, and West (2004)*

The focus of this paper is to directly test for the equivalence of subjective and objective measures of performance. The comparisons undertaken (based on Spearman Rank-Order Correlation Coefficients) considered, first, whether subjective and objective measures of a particular performance variable are positively correlated (what the authors call convergent validity). This is a relatively simple validity check. The second is more stringent and considers whether this first set of associations is stronger than the correlation between a particular objective (subjective) measure of one performance variable and objective (subjective) measures of other performance variables (discriminant validity). Finally, the analysis examines whether subjective and objective performance measures are related in the same way to various human resource management practices (construct validity).

The empirical analysis is based on data from two previous studies which are augmented with additional performance measure data necessary to carry out the various comparisons. The first is a study of 80 manufacturing companies all employing more than 50 people. The objective measure is of financial performance recorded as the pre-tax financial value of sales less costs taken from company accounts. The subjective measure is based on a question asking respondents to rate their company's performance relative to their main competitors on a five-point scale from 'much worse' through 'average' to 'much better'.

The second study used is also based on a sample of manufacturing companies employing 50 people or more (see Guest et al, 2003, and Michie and Sheehan, 2001, 2003). The objective performance measures are the pre-tax financial value of sales per employee and gross sales per employee derived from the EXTEL database. The corresponding subjective measures are based on respondents' recording the profitability (and productivity) relative to other establishments in the same industry (the WERS variables) on the same five point scale used above.

The results can be summarised as follows. Evidence for convergent validity was found in both analyses. In the first, the correlation between subjective and objective measures of profitability was around 0.4 and statistically significant. In the second, the correlations were in the range 0.38 to 0.65 with all statistically significant and with most correlation coefficients larger than 0.5.

Evidence regarding discriminant validity is based on comparisons of the above correlation coefficients with those between current and previous years' measures and between current/previous measures of profitability and productivity. The evidence presented is unequivocal with subjective and objective measures of the same performance variable stronger than those between objective (subjective) measures of different variables.

Finally, the question of construct validity was addressed using nine management practice variables. Again, the results reported indicate a significant level of equivalence between the correlations for the objective measures of performance and the incidence of different management practices, on the one hand, and the corresponding correlations for subjective performance measures on the other.

Although the statistical analysis lacks sophistication and the estimated correlations are not particularly high, the findings of this study run counter to the assertions that subjective measures of performance are necessarily unreliable.

*(c) Haskel(2005)*

The final comparison study we consider is perhaps the one most relevant in the present context in that it actually compares responses from the 1998 WERS on productivity and profitability with objective measures of these variables. This is achieved by matching the WERS data with information from the ABI, something made possible because both surveys draw their samples from the same sampling frame (the Inter-Departmental Business Register). Notwithstanding the common sampling frame, there are significant problems in actually matching the 1998 WERS data to the ABI on an establishment by establishment basis and the comparison could be undertaken for only 175 workplaces.

The analysis involves a three-stage approach. In the first place, the distribution of establishments across the subjective measures of productivity is compared with actual data on gross output per employee relative to the relevant industry average for these establishments (the industry average being measured at SIC Group level). The results of this exercise suggest substantive differences between the subjective and objective measures: in particular, a number of those respondents who report an above average level of relative productivity on the subjective measure actually have below average productivity on the objective measure. Similarly, there is considerable variation in actual relative productivity levels within each subjective category.

The second stage of the Haskel comparison is to estimate a number of ordered probit models using a variety of equation specifications and including both objective measures of profitability and productivity. Overall, the results offer little comfort to those who believe that subjective and objective measures are equivalent with there being no evidence of a statistically significant correlation between the two types of measures.

The final analysis involves testing for construct validity by investigating whether the subjective and objective measures give similar results in terms of the impact of human resource management or industrial relations practice on performance. In this case the impact of unions on productivity is considered. Again, subjective and objective measures are found to produce very different results, unions are found to enhance productivity when an objective measure of productivity is used but no union-productivity relationship is found using a subjective measure.

#### **4. Objective Measures of Workplace Performance in WERS 2004**

Clearly, one approach to obtaining objective performance measures for WERS 2004 would be to follow that of the Haskel study and merely to link the WERS sample of workplaces with the corresponding data from the ABI as both have common sampling frames. However, the preceding discussion highlighted that, for WERS 1998, only a relatively small number of linked observations were available for analysis. The causes were two-fold. First, the ABI covered only the production sector at the time that WERS 1998 was being designed and put into the field so that consent was sought only from WERS establishments operating in the production sector. Second, that being a sample survey among enterprises with fewer than 250 employees, the ABI has only partial coverage of the population of private sector businesses. Consequently, only some of the workplaces providing consent in WERS 1998 could be identified on

the ARD as having provided an ABI return for 1997. It was also the case for establishments belonging to multi-plant organisations that the unit of observation in the ABI and WERS did not commonly correspond, as the ABI tends to be completed at enterprise level.

The problems evident in trying to link WERS 1998 and ABI performance data led the Performance/Technology Specialist Team and the WERS Research Team to consider how objective performance data might be better collected in WERS 2004. It was clear that the size of any WERS-ABI linked dataset could be extended considerably by a more wide-ranging consent question that included service industries and which also provided for linkages to be made to multiple years of data in the ARD. However, one would still expect only a subset of WERS workplaces to feature in the ARD and questions would still remain about the common mis-match in units of observation. Accordingly, it was also agreed that, subject to successful pre-testing, WERS would attempt to collect data at establishment level through the development of a new questionnaire focused specifically on financial performance. The development of the Financial Performance Questionnaire also arose out of an appreciation – subsequently supported by ONS research (Mills and Palmer, 2007) – that many organisations do hold data on the performance of individual establishments, although they may not always choose to supply such detailed information in response to the ABI.

The result was a four-page questionnaire that was issued to all workplaces at the end of the Cross-Section Management interview. Most of the questions that were included in the Financial Performance Questionnaire were based on those used in the short-form versions of the ABI. The main alteration was to shorten some of the very detailed ABI instructions about what should be included or excluded in the totals, recognising that an overly technical questionnaire may provoke non-response among potential respondents who were not specialised financial managers or accountants. Further departures from the ABI were to include questions on the numbers of full and part-time employees, the value of assets and the extent of research and development activity. Research economists and professional accountants were consulted over the range and wording of questions prior to piloting.

FPQs were distributed in 2,076 of the 2,295 workplaces that participated in the Cross-Section Survey (Chaplin et al, 2005: 63).<sup>2</sup> Following a three-stage reminder process, FPQs were obtained for 1,070 of these workplaces, representing a response rate of 52 per cent among workplaces accepting placement of the questionnaire and a rate of 47 per cent among all Cross-Section workplaces (*ibid*). Respondents were encouraged to complete the questionnaire solely about the workplace that had been the subject of the Management interview, but were given the option to report on some larger observational unit, e.g. the whole enterprise, if this was not practical. In the event, some 834 of the 1,070 FPQs were completed with reference only to the WERS workplace. The process of linking WERS to the ARD was also repeated, with 700 workplaces being found to have an ABI return covering a financial period that included the date of the WERS 2004 management interview (most of these returns deriving from the 2004 ABI). In 132 of these 700 cases, the ABI return covered only the workplace surveyed in WERS. But there is the promise of longitudinal data once later years of the ABI are released: around four-fifths of matched workplaces have ABI returns for 2003 as well as 2004.

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<sup>2</sup> Questionnaires were issued to workplaces in the private and public sectors. Public sector establishments were asked to report on the value of their overall budget, rather than levels of turnover.

One inevitable disadvantage of the FPQ compared to the ARD was that the data obtained in the FPQ referred to a single year. In order to promote some consistency in the periods covered by the FPQ returns, respondents were invited to provide figures for the calendar year 1<sup>st</sup> January -31<sup>st</sup> December 2003. If this was not possible, they were invited to respond about the most recent business year for which figures were available. In total, 406 (38 per cent) of the 1,070 FPQ returns covered the default period, with a further 325 (31 per cent) reporting on the financial year April 2003 – March 2004.<sup>3</sup> The data collected in the FPQ are therefore historical in nature: only 58 returns cover periods that include the date of the main management interview, with the remaining returns covering periods that ended, on average, 6 months prior to the interview date.<sup>4</sup> But this is a necessary consequence of administering the questionnaire alongside the management interview and, indeed, the data differ little in its historical respect from the subjective rating (which is inevitably based on some historical comparison), other quantitative measures collected in WERS (on absenteeism or disputes) or the quantitative performance data collected in other workplaces surveys (such as the US National Employer Survey).<sup>5</sup>

It is important, in the present context, that the objective data used should relate to the workplace, rather than to the whole enterprise, and that it should also relate to a period that is as close as possible to the date the WERS subjective data were collected. If these factors did not hold, it would not be surprising to find that the subjective and objective measures did not correspond. In the present study we focus on establishments for which objective data was provided at site level and related to the most recent completed financial year prior to the Management interview date. We also focus on the data available for trading sector workplaces (those operating in the private sector plus trading public corporations and nationalised industries), as public sector establishments have commonly been excluded from empirical work using the subjective measures. The ABI was used to provide additional information for some workplaces that did not complete the FPQ or where the ABI data coincided more closely with the Management interview date than the FPQ information for the same workplace. Overall, 597 of the 1,757 trading sector workplaces in the WERS 2004 Cross-Section Survey had site-level objective data on labour productivity that related to a time period within one year of the Management interview date; 526 trading sector workplaces had equivalent objective data on profitability.<sup>6</sup> Around 70 per cent of the observations derived from the FPQ with the remainder derived from the ABI. Further details on the FPQ, the process of matching WERS to the ABI and other technical issues can be found in Forth and McNabb (2007).

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<sup>3</sup> It was not possible to use April 2003 – March 2004 as the default period for the questionnaire, since fieldwork began in February 2004.

<sup>4</sup> The median number of days between the end of the FPQ return period and the date of the management interview in these cases was 154 days (mean 182 days; standard deviation 118 days).

<sup>5</sup> A future WERS might consider issuing a financial performance questionnaire some time after the management interview, in an attempt to collect more data that spans the interview date, but this raises obvious concerns about maintaining the consistency of the unit of observation and minimising attrition or non-response. There is, of course, the option of repeating the FPQ at a later date for the same establishments, in order to obtain longitudinal data on financial performance akin to that available in the ABI.

<sup>6</sup> The data provided two measures of labour productivity: turnover per worker and gross value-added per worker. Profitability was estimated in a rudimentary manner as gross value-added minus employment costs and capital expenditure, again divided by the number of workers.

## 5. An Analysis of Performance Data in WERS 2004

The analysis presented here builds upon the previous work of Wall et al (2004) and Haskel (2005) and examines the relationship between the subjective measures of productivity and profitability and the objective measures of these variables available from the Financial Performance Questionnaire and Annual Business Inquiry. Specifically, we test for convergent validity, that is, the degree of direct correspondence between the two types of measures. We then test for discriminant validity by investigating the extent to which the different subjective measures appear to discriminate between the different objective measures. Finally, we examine the extent of construct validity by estimating very simple models of productivity and profitability determination. This analysis considers whether there is consistency in estimated structural models relating workplace productivity/profitability to a set (albeit limited) exogenous variables.<sup>7</sup>

It should be noted at this point that whilst this analysis provides a useful insight into the level of correspondence between subjective and objective performance measures, two important caveats should be borne in mind. First, cross section analyses of the determinants of performance – whether based on objective or subjective measures – may indicate the various correlates of performance but do not identify the nature of the causal link between these. For example, one may observe a positive relationship between the incidence of performance-related pay and workplace labour productivity. But it is more difficult to disentangle whether the former caused the second or whether the relationship goes the other way, namely high performance establishments are more likely to introduce performance related pay.

Second, we have already noted that WERS is rich in details of human resource management and industrial practices. Indeed, these are often captured not simply in terms of whether they are present or not but also on the depth of the practice within the workplace. However, we noted earlier that outcome variables such as productivity and profitability are underpinned by a wide range of other factors and only some of these are typically captured in the WERS data. Consequently, there will be unobserved heterogeneity which may give rise to spurious correlations between performance measures and the variables that are included in any analysis.

Notwithstanding these issues, we now turn to the empirical analysis. As noted above, the starting point is the sample of 597 trading sector establishments with at least some site-level objective data on productivity (526 in the case of profitability). Around 20 observations are excluded in either case due to suspicious outlying values on the objective measures. Some cases are also lost to non-response on the subjective measures. And the sample available for the profitability analysis is further limited by restricting the focus of that comparison to respondents who stated that their subjective evaluation of ‘financial performance’ related to profitability, rather than other possible measures such as sales.

The focus of the first set of results is on the various measures of workplace productivity. As it is not possible to know whether respondents base their subjective assessments of productivity in terms of output or value-added per employee, measures of both are considered here. Also, because the number of observations for the two

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<sup>7</sup> The analysis extends the initial investigation presented in Kersley et al (2006) in a number of notable ways by: incorporating data from the ABI, focusing only on site-level returns; minimising the chronological distance between the objective and subjective measurements; and including a test of discriminant validity.

'below average' categories is small, these have been combined into one (this is also done in the profitability analysis).

The first validity test is that for convergent validity. Looking at Table 1, the first two panels of results show the distribution of workplaces according to the categories used in the subjective measure of productivity by the mean, 25<sup>th</sup>, 50<sup>th</sup> and 75<sup>th</sup> percentile values of the objective productivity measures (£'000s). The results present an interesting and mixed picture. There is some evidence that the means of the objectively-measured productivity levels increase monotonically across the subjective categories. The notable exception is that mean output per head and mean value-added per head are both higher among respondents who assess the productivity of their workplaces as 'about average' than among respondents who assess it as 'above average'. The pattern is somewhat more confused among the three percentile points considered. It is important to note, moreover, that there is also a high degree of overlap between categories, that is to say that there is at least as much variation in objectively-measured productivity levels within each category of the subjective rating as there is between those categories.

**Table 1 Convergent Validity Test: Subjective and Absolute Objective Measures Of Productivity**

	<i>Subjective Measure</i>				
	Total	Below/Lot below average	About Average	Above Average	A lot above Average
<b><i>Objective Measure:</i></b>					
<b><i>Output per Head (£'000s)</i></b>					
Number of observations	506	51	218	203	34
Mean	109.42	95.89	112.18	105.82	133.52
25 <sup>th</sup> percentile	29.50	39.40	29.60	27.14	28.33
50 <sup>th</sup> percentile	60.25	60.30	65.86	57.44	45.92
75 <sup>th</sup> percentile	124.27	105.50	132.10	125.89	134.00
<b><i>Objective Measure:</i></b>					
<b><i>Value Added per Head (£'000s)</i></b>					
Number of observations	499	51	215	198	35
Mean	40.44	33.18	42.59	38.69	47.80
25 <sup>th</sup> percentile	15.37	18.13	14.71	15.62	13.69
50 <sup>th</sup> percentile	27.52	23.51	27.37	28.67	29.69
75 <sup>th</sup> percentile	47.75	35.70	50.14	47.75	70.08
<b><i>Objective Measure:</i></b>					
<b><i>Relative Output per Head</i></b>					
Number of observations	429	48	180	172	29
Mean	1.23	0.93	1.38	1.15	1.26
25 <sup>th</sup> percentile	0.56	0.57	0.57	0.47	0.65
50 <sup>th</sup> percentile	0.88	0.74	0.91	0.89	0.88
75 <sup>th</sup> percentile	1.31	1.12	1.30	1.33	1.67
<b><i>Objective Measure:</i></b>					
<b><i>Relative Value Added per Head</i></b>					
Number of observations	426	48	178	171	29
Mean	1.44	1.11	1.62	1.36	1.37
25 <sup>th</sup> percentile	0.64	0.55	0.67	0.64	0.59
50 <sup>th</sup> percentile	0.95	0.83	0.95	1.04	1.16
75 <sup>th</sup> percentile	1.61	1.20	1.64	1.65	2.69

One possible reason for this is that the subjective measure has the implicit benchmark of the industry average (see Appendix A). A similar analysis is therefore undertaken using an objective measure that is also expressed relative to the industry average. The latter is obtained by computing the ratio between the objective level of productivity at the workplace and the most detailed level of industry data available within the published ABI tables (usually SIC(2003) Class level, i.e. 4-digit).<sup>8</sup> The results of the comparisons between these relative objective measures and the subjective evaluations are presented in the final two panels of Table 1. One improvement on the previous analysis is that the median values of relative value-added are now clearly monotonically increasing across the subjective categories. But a notable similarity is that the mean values of objectively-measured relative productivity levels are higher, on average, amongst those respondents who reported the productivity levels at their establishments to be average than among respondents who assess it as 'above average'. And again, it is evident that there is a high level of overlap across categories and that the correlations are far from perfect. The results bear a number of similarities with those presented by Haskel (2005) using 1998 data.

We turn now to the results of the tests for convergent validity for the subjective and objective measures of *profitability* (shown in Table 2). Interestingly, objective and subjective measures of profitability show more evidence of equivalence. First, it is clear that the mean values of both the absolute and relative measures of profitability are monotonically increasing across all the subjective categories. The same is true of almost all of the percentile values so that, in a very general sense, establishments that have higher (lower) levels of objectively-measured profitability are also those that tend to have been subjectively rated as more (less) profitable in the Management Interview. As with productivity, we find that the relationship is not perfect and that there is overlap between categories. However, the extent of overlap is significantly less for profitability than for productivity. This may reflect greater clarity as to what is being asked about in this subjective question.<sup>9</sup> Alternatively, it might suggest that respondents to the WERS interview are better able to assess the profitability of their establishments than they are to make assessments about productivity levels at the workplace.

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<sup>8</sup> The published ABI tables are available at: <http://www.statistics.gov.uk/abi/>. The relative measure is not computed for workplaces operating in Education and Health, because of concerns about the reliability of the published figures in those sectors (see Daffin and Lau, 2002), nor for workplaces operating in Financial Intermediation because the ABI does not cover that sector.

<sup>9</sup> Remember that we have restricted our analysis to those who noted that their evaluation of financial performance was based on profitability, rather than some other measure. Respondents are not invited to provide an equivalent reference point for their subjective evaluation of labour productivity.

**Table 2 Convergent Validity Test: Subjective and Absolute Objective Measures Of Profitability**

	<i>Subjective Measure</i>				
	Total	Below/Lot below average	About Average	Above Average	A lot above average
<i>Objective Measure: Profit per head (£'000s)</i>					
N	280	31	110	107	32
Mean	17.30	-0.15	13.78	20.97	34.07
25 <sup>th</sup>	0.43	-3.65	0	2.14	6.64
50 <sup>th</sup>	7.38	0.42	5.70	8.28	15.83
75 <sup>th</sup>	21.18	8.78	20.76	23.44	39.90
<i>Objective Measure: Relative profitability</i>					
N	256	28	102	98	28
Mean	1.72	0.82	1.42	1.82	3.37
25 <sup>th</sup>	0.03	-0.25	0.03	0.09	-0.21
50 <sup>th</sup>	0.69	0.06	0.73	0.71	1.29
75 <sup>th</sup>	2.27	0.82	1.97	2.72	3.41

The evaluation of discriminant validity involves a number of two-way comparisons. In the first instance, one might expect a subjective measure of one financial variable (say productivity) to explain more of the variation in an objective measure of that same financial variable than it does of the variation in an objective measure of a different financial variable (say profitability). In the second instance, one might expect a subjective measure of productivity to explain more of the variation in objective productivity than does a subjective measure of profitability. In order to test for discriminant validity we simply regress the relative objective measures of the performance variables on the subjective measures. For ease of exposition we present only the R-squared figures here. As Table 3 shows, the results suggest an almost total lack of discriminant validity. If discriminant validity were present, one would expect the R-squared figures in the shaded cells to exceed those in the unshaded cells when comparing across the rows and down the columns of the table. Only two of these seven possible comparisons are in support of discriminant validity. First, comparing across the rows of the table, the subjective evaluation of productivity explains more of the variance in output per head than it does in profitability, but the same is not true when looking at the value-added productivity measure. And the subjective evaluation of profitability explains more of the variance in objective productivity than it does in objective profitability. Second, comparing down the columns, the subjective evaluation of profitability explains more of the variance in objective profitability than does subjective productivity. But it also explains more of the variance in both objective productivity measures. Although productivity is a key determinant of profitability, we would still expect to find a stronger association between subjective and objective measures of what might appear to be the same underlying constructs. Clearly, the results are not indicative of discriminant validity.

**Table 3 Discriminant Validity**

	<b>Relative output per head</b>	<b>Relative value - added per head</b>	<b>Relative profitability</b>
<b>Subjective productivity</b>	0.0152	0.0045	0.0057
<b>Subjective profitability</b>	0.0305	0.0679	0.0183

Note: Cells indicate R-squared obtained in regressions of the natural log of each objective measure on either subjective measure.

The final type of analysis we undertake further investigates the equivalence of the underlying constructs in the subjective and objective measures by examining whether the correlates of subjective and objective measures of performance are the same. The basic approach we adopt here is to regress the performance variables on a set of variables measuring union recognition, foreign ownership, incentive pay and the extent of off-the-job training at the establishment: common foci for past research on workplace performance using WERS. Industry and organisational size dummy variables were also included in the estimation. A number of different models were estimated and so the results (reported in Table 4) are presented in summary form. If the subjective and objective measures do reflect different takes on the same underlying construct (productivity, say), then we would expect the associations with the chosen independent variables to be of the same sign and also for them to be in line with prior expectations. This test also begins to address the question of whether past research that has had to rely on the subjective evaluations would have reached the same conclusions with access to objective measures.

**Table 4 Construct Validity Test**

<i>Dependent Variable</i>	<i>Exogenous variables</i>				Number of observations	
	Foreign-owned	Union Recognition	Training	Incentive pay		
1) Output per head	+	*	-	*	+	571
2) Value Added per head	+	*	-	*	+	566
3) Subjective Productivity	-		-	*	+	1545
4) Relative Output per Head	+	*	-		+	481
5) Relative Value Added per Head	+	*	+		-	470
6) Output per head	+	*	-	*	+	490
7) Value Added per head	+	*	-	*	+	490
8) Subjective Productivity	+		-		+	490
9) Relative output per head	+		-		+	425
10) Relative value-added per head	+	*	+		-	425
11) Subjective Productivity	+		-		+	425
12) Profitability per head	+	*	-	*	+	502
13) Subjective profitability	+		-		+	929
14) Relative Profitability	+	*	-	*	+	418
15) Profitability per head	+	*	-	*	+	278
16) Subjective profitability	+	*	-		+	278
17) Relative profitability per head	+	*	-	*	+	255
18) Subjective profitability	+	*	-		+	255

*Notes: 1) - 5) are estimated using all available cases; 6) – 8) are estimated across the same sample of establishments; 9) – 11) are estimated across the same sample of establishments and the objective measures are relative to the 4-digit industry; 12) – 14) are estimated using all available cases; 15) – 16) are estimated across the same sample of establishments; 17) – 18) are estimated across the same sample of establishments and the objective measure is relative to the 4-digit industry. In addition, industry and size dummy variables were included in the estimation but are not shown. The natural log of each objective measure is taken prior to analysis.*

Looking first at the results for productivity, the first three rows compare the results for the two objective productivity measures with that for the subjective measure. The sample sizes of the models differ depending on the extent of missing data as we are using all available cases in each model. As can be seen, the subjective and objective measures do not lead to substantially different conclusions when used in this type of analysis. The associations between workplace productivity and union recognition or incentive pay are consistent though that with foreign ownership is not. Off-the-job training is found to be positively associated with all three measures of productivity but is statistically significant only when the subjective measure is used.

The next two rows present the findings when we switch to use the constructed relative objective measures of productivity. These relative measures did not perform noticeably better than the basic measures of productivity levels in our tests of convergent validity (Table 1), and they may not represent natural dependent variables for an analysis of workplace performance, but we include them here for completeness. Overall, these do not perform as well and the level of congruence between objective and subjective measures of productivity as reflected in the estimated structural models is weak.

In rows 6-8, we estimate the first three models again but this time across the same sample of workplaces, to protect against the possibility that the reduced sample of workplaces with objective data may suffer from some uncorrected non-response bias. As the results indicate, these also show a general level of consistency in all the associations, notably bringing the association with foreign ownership into line across all three measures. The associations here are also all in line with prior expectations. However, the levels of significance when the subjective measure is used as the dependent variable are low. Rows 9-11 repeat the exercise using the relative objective measures of productivity, again with less satisfactory results.

The remainder of the table presents equivalent results for the subjective and objective measures of profitability. As with the analysis of productivity, a number of models are estimated across different samples of establishments. Rows 12 and 13 suggest a level of congruence in terms of the nature of the correlations identified in the data though the levels of statistical significance vary depending upon whether an objective or subjective measure of profitability is used. The next row shows the model estimated using a relative objective measure of profitability. Again, there is similarity in terms of the signs of the coefficient estimates but with levels of significance stronger when the objective measure is used than when the subjective measure is the dependent variable. When we estimate the equations using the same sample of establishments (rows 15-16 and 17-18) the results on foreign ownership and union recognition are very similar between the objective and subjective measures, but those on training and incentive pay are less so.

### **Conclusions**

The purpose of this study was to compare the relationship between subjective and objective measures of workplace performance available from WERS 2004. Such an analysis is important if it is assumed that subjective measures of productivity and profitability are proxies for, typically, unobserved objective measures. The methodology adopted here is based on previous work by Wall et al (2004) and Haskell (2005) and involves testing for convergent, discriminant and construct validity. The main conclusion from the analysis is that there is evidence of some congruence between the subjective and objective measures. However, the various

measures are not perfectly aligned and are thus not likely to give precisely the same results.

In tests of convergence, we find evidence that subjective and objective measures are positively correlated and that objectively-measured productivity and profitability generally increases across the categories of the relevant subjective measure. It is also notable that the objective and subjective measures of profitability are more closely aligned than the equivalent measures of productivity, perhaps reflecting greater variance in the interpretation of productivity within the survey interview. Nevertheless, there are some substantial caveats. Mean productivity, measured objectively, is higher among respondents who consider the productivity of their workplace to be about 'average' than among those who consider it 'above average'. Moreover, there is a great deal of overlap in the distributions of the objective measures within each category of the subjective rating, both in respect of productivity and profitability.<sup>10</sup>

The test of discriminant validity was less encouraging, and presented little evidence that subjective and objective measures of the same type of performance variable are more closely correlated than with subjective and objective measures of the other type of performance.

Despite these findings, there is qualified support for the hypothesis both types of performance measures produce similar results when used in structural models of the determinants of workplace performance. When estimating on an identical sample, the objective and subjective measures of productivity yielded identically-signed associations with the limited set of independent variables chosen for the analysis. Interestingly, the main difference was that the levels of statistical significance were lower when the subjective measure of performance was used. The equivalent analysis of profitability yielded slightly less consistency in the signs of the associations, but a greater level of consistency in significance levels. These findings, in particular, might provide some degree of support for past research based on the subjective evaluations..

There are, of course, good reasons why the relationship between subjective and objective measures is not stronger. As noted earlier, there is the potential for measurement error in the subjective assessment of performance. Equally, objective measures of performance may also be subject to measurement error if establishments adopt different accounting practices. The lack of a stronger relationship might equally reflect our inability to precisely replicate the underlying information contained in the subjective evaluations when constructing the objective measures. This may be due to different definitions of productivity or profitability or because respondents to the management interview do not conceive 'their industry' in the way defined here (SIC(2003) Class level) when providing their subjective assessment. It may be that they define the activities of their industry more narrowly or more broadly, focus only on competitors offering similar prices or levels of quality, or consider only local competitors. If this is the case, such aspects of unobserved heterogeneity are to some degree factored out of the subjective measure in ways that cannot easily be replicated. And as a consequence, it may be rather optimistic to believe that an objective measure of performance can be constructed that is exactly equivalent to the subjective ones.

Notwithstanding this, it would seem that objective and subjective measures can give valuable perspectives on workplace performance. Each has advantages and disadvantages and the results presented here would suggest that it would be prudent

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<sup>10</sup> Work is ongoing to investigate whether the degree of convergence is greater for some types of workplace than others (for example, single independent workplaces or those for which the subjective rating was provided by a financial manager).

for future research on workplace performance to give most weight to findings that can be replicated across both objective measures and subjective ratings.

## **Appendix A: WERS 2004 questions to obtain subjective evaluations of workplace productivity and financial performance**

### **KESTPER1**

Compared with other establishments in the same industry how would you assess your workplace's ...READ OUT.

...financial performance :

1. A lot better than average,
2. Better than average,
3. About average for industry,
4. Below average,
5. A lot below average,
6. No comparison possible,
7. Relevant data not available

### **KESTPER2\***

...labour productivity :

1. A lot better than average,
2. Better than average,
3. About average for industry,
4. Below average,
5. A lot below average,
6. No comparison possible,
7. Relevant data not available

Notes:

1. In both cases, the respondent was given a show-card displaying the first five response options.
2. The question on financial performance (KESTPER1) was preceded by another asking the manager to state the measure that corresponded most closely to their interpretation of financial performance (profit, sales etc).

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