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ABSTRACT

Management Economics in a Large Retail Organization*

We study the impact of and reward to middle management ability using data from 245 stores of a nationwide retailer. The company scores six broad areas of management practice, the most important of which turns out to be "commercial awareness", where able managers raise labour productivity by 17% compared to less able. We show that the managers' incentive scheme is implicitly an insurance one, with managers taking a share in deviations of actual sales from expected. At the same time, abler managers do not receive higher pay all else equal, which implies that middle management ability is not fully tradable.

JEL Classification: D21, J24, M20, J33, M52

Keywords: management, firm behaviour, business economics, productivity, compensation methods

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This study investigates the link between management and economic performance at the establishment level. Our unique data enable us to assess the overall contribution of the important, but elusive, management factor of production, as well as partition it into standards of practice and personal abilities. We also examine the pay system that the firm uses to make the most of its management stock.

Our data come from 245 stores belonging to a large UK clothing retailer. By comparing subunits within a firm, all of which apply the same standards to management measurement, we obtain essential control over our key management variables. In this respect, our study is similar to that by Griffith *et al.* (2006) who collect data on management ability and productivity within the branches of a single organisation, a nationwide UK building materials firm. Overall, therefore, our organisation's hundreds of stores scattered nationwide provide a unique experimental setup within which to analyse the relationship between middle management ability, pay and productivity.

We measure management ability using the company's own survey of six key behavioural indicators (KBIs): "sales focus", "commercial awareness", "developing people", "drive and personal development", "leadership", and "planning and organising". Depending on the evidence provided for each of the survey's questions, each participating store manager was given one of the three grades for each KBI – "development need" (signifying inadequate performance), "capable" (minimum appropriate performance) and "strength" (exceptional performance).

There are two parts to our analysis. First, we establish the link between labour productivity in each store and the manager's ability as measured by his/her KBIs. We obtain plausible estimates of the differences in labour productivity between stores run by managers with different KBI grades, with commercial awareness being the most important. We also derive the contributions to labour productivity of management practices (the difference in productivity between the grades capable and development need, 11%) and management ability (the difference between strength and capable, 6%).

In the second part of our analysis we aim to explain why some managers perform above the required practice standards by considering manager pay incentives. An effective linkage of a store manager's pay to her store's sales performance is presumably required to explain our finding of a further contribution of management beyond the grade capable. We indeed find such a link. While managers do not have explicit performance pay contracts, we find that they share in both positive and negative deviations of store productivity from expected.

1 Prior literature and our study

Management has been put firmly among the factors determining labour productivity in the academic literature (e.g., Bartelsman and Doms, 2000; Kaldor (1934) was a pioneer). Here we study the store manager level of the organisational hierarchy, leaving aside the upper levels, i.e. those of the area manager and the company's headquarters. Since management input varies greatly between firms and workplaces, it is likely to have a large effect on economic performance, at least at the low levels of aggregation.

The literature distinguishes between management ability and management practices, a distinction we also adopt. Performance rankings are often used to measure ability. Thus, Alvarez and Arias (2003) use an establishment fixed effects ranking as a measure of management input, and find that it reduces average costs of production. Similarly, output has been found to be positively correlated with rankings on inventory, sales, strategic management (Baumel and Fuller, 1964; Sonka *et al.*, 1989), product quality and sales and budget goal attainment (Mefford, 1986). Griffiths *et al.* (2006) use a wider "balanced scorecard" approach to assess management ability in each store in a UK building materials wholesaler, averaging manager scores on financial, customer satisfaction, innovation and internal controls criteria. They find a movement from the lower to the upper quartile in management ability to account for 40% of the interquartile range of labour productivity (p. 523), which is close to our result. Bloom and Van Reenen (2007), using a more sophisticated measure of management input, find that the same movement explains 10-23% of the interquartile total factor productivity (TFP) range (p. 1371). Our estimate for total factor productivity is higher, which we explain.

Another approach to measuring management ability is simply to sweep it out by allowing for a manager fixed effect (for example, Black and Lynch's (2004) study of workplace innovation). Mundlak (1961) reports reductions in factor input elasticities once local management is controlled for by means of such fixed effects, implying a positive "elasticity" of management input. (Lucas (1978) has derived a theoretical model explaining why better managers should be employed in bigger firms, which explains the reported reduction in input elasticities more completely.) Lieberman *et al.* (1990) find changes in particular top managers to be the most important force behind productivity growth in major U.S. and Japanese car manufacturers. Bertrand and Schoar (2003) also report that particular top managers significantly affect firm policies and returns on assets, using a sample of 2,300 large U.S. firms. While the fixed-effects approach is useful (we too use fixed effects for area managers), our management data allow more insight into the workings of management than simply sweeping them out via fixed effects.

The literature on management practices concerns individual practices as well as "bundles". Most studies on individual practices have looked at human resource management (HRM). Significant improvements in firm performance have been found with more employee training (de Grip and Sieben, 2005; Dearden *et al.*, 2006), better communication between employees and management (Kersley and Martin, 1997; Bartel, 2004), greater employee participation in decision making (Black and Lynch, 2004; Srivastava *et al.*, 2006), and performance-related pay and promotion (Kahn and Sherer, 1990; Audas *et al.*, 2004). Performance pay is a particularly powerful practice, as shown by Bandiera *et al.* (2007) who found a 21% increase in workers' productivity in response to the introduction of managerial performance pay (see also Lazear (2000) who found a 44% productivity increase following a shift from flat to piece wage rate.) Performance pay for store managers plays an important role in explaining our results. Our measure of HRM practices, however, does not fare well in the productivity regressions, which we explain.

A few studies look at practices outside HRM. Galbraith and Nkwenti-Zamcho (2005) report a positive impact on labour productivity of equipment maintenance, firm reorganisation and labour specialisation. Bloom and Van Reenen (2007) survey four areas of management practices - operations, monitoring, targets and incentives (18 practices altogether) - in companies across four countries and find that all practice areas (and many individual practices) are important for labour productivity. We too use indicators from a wide range of practices, finding, however, that not all of them are significant.

Several studies look at the effects of management practice "bundles". Arthur (1994) classifies HRM policies into "control" and "commitment" HRM systems and finds workplaces with a "commitment" HRM system to have higher labour productivity. Ichniowski *et al.* (1997) report a similar finding, having grouped the observed HRM practices into four systems, from the most traditional (i.e., control) to the most innovative (i.e., commitment, or high-performance). They also find the impact of HRM practices to be at its maximum when they are grouped into bundles that reinforce complementarities between them, a finding also reported in Macduffie (1995). As a robustness check to our main results, having grouped management grades together, we too find some evidence that management practices complement each other.

2 The model and estimation issues

Following the modelling approach of Ichniowski *et al.* (1997) and Bartel (2004), we went to meet the company's managers for ideas on the model to describe sales of an individual store. We took a series of interviews between February and October 2006 and came up with the following description.

2.1 Store sales

A store receives goods and sells them after adding a certain markup. Sales depend on the cost of sales, labour and store space, as well as store, area and workforce characteristics, including store management. It is also affected by various unobservable circumstances, both specific to a particular store (e.g., unobserved location characteristics) and idiosyncratic (e.g., temporary disruptions in business). We do not have information on the cost of sales, but, plausibly assuming that it is a constant fraction of the total sales, we will abstract from it.

We also control for the possibility of different goods having different mark-ups by controlling for store type and location and the share of children's goods in total sales.

The observed sales volume is the outcome of solving the problem of allocating limited resources between the stores by the central management in the long and medium run, and delegating this solution in the short run to the local store managers. By definition, in the long run (several years in our case) all inputs are variable. In the medium run, while capital and management inputs are given, labour input may be corrected taking into account changes in operating environment and newly acquired information. This correction takes place at the beginning of the accounting year (February), by allocating an annual wage budget to each store equal to an agreed fraction of its last year's sales (the average for 2005 was around 10%). In the short run (i.e., within the year), store managers allocate labour between weeks to utilise their wage budget, while all other variables remain given. In so doing they must match labour inputs to seasonality of sales, with peak periods at Christmas, Easter, and the start of the school term.

This simple description lends itself to the following short-run sales function:

$$y_{ipt} = f(l_{ipt}, s_{pt}, \mathbf{x}_{ip}) + u_{ip} + e_{ipt}, \qquad (1)$$

where i, p and t are store, year and week counters; y is log sales; l is log weekly labour input; s is a weekly dummy to capture seasonality of sales; $\mathbf{x}$ is the vector of other explanatory variables; u and e are unobservable store-specific and idiosyncratic shocks to sales, respectively. Notice that l has all three indices because labour input varies by store, week and year, while the weekly dummies are the same for all stores (hence no store index i) and the other controls, though different across stores, are fixed for the duration of the year (hence no t index).

Since we have complete data only for one year, 2005, the index p in equation (1) may look redundant, but it does play a role as we now show. Suppose the unobservable shock to sales u_{ip} follows a first-order autoregressive process:

$$u_{ip} = \phi \cdot u_{ip-1} + \eta_{ip} \ , \tag{2}$$

where $0 < \phi < 1$ is the autoregression parameter, η_{ip} is annual random noise in sales which follows a continuous distribution with zero mean and a finite second moment and is independent of the regressors and serially uncorrelated; also $cov(u_{ip}, \eta_{ip+1,2,...}) = 0$.

The profit-maximising solution of the resource allocation problem in the long run implies proportionality between the inputs. So, given the input prices, we expect to see better managers appointed to bigger size stores and managing more labour. This allocation of managers to stores, and labour to managers, is consistent with the theoretical insight of Lucas (1978) that better managers control more assets. In the medium run, however, capital and management inputs are fixed. Thus the only way to adapt to changes in trade environment is to adjust annual labour input. Part of this adjustment happens in response to changes in trading environment, and part is due to changes in the expected value of the unobservable term, $E(u_{ip}) = \phi \cdot u_{ip-1}$ (equation (2)), implying that labour input in year p is a positive function of the last year's unexpected sales, u_{ip-1}, which is consistent with the company's actual wage budget practice.

For an illustration, consider a Cobb-Douglas sales function with two inputs, labour (L) and capital (K). Maximising expected sales across the stores, $\sum_{i=1}^{N} L_{ip}^{\alpha} \cdot K_{ip}^{\beta} \cdot e^{\phi \cdot u_{ip-1}}$, subject to the budget constraint, $\sum_{i=1}^{N} w_{ip} \cdot L_{ip} = B$, with wages ($w$) given and capital input fixed, a typical first-order condition is:

$$\ln L_{ip} = -\frac{1}{1-\alpha} \cdot (\ln \lambda + \ln w_{ip}) + \frac{\beta}{1-\alpha} \ln K_{ip} + \frac{\phi}{1-\alpha} \cdot u_{ip-1}, \quad (3)$$

where $\lambda = B^{\alpha-1} \cdot \sum_{i=1}^{N} w_{ip}^{-\alpha} K_{ip}^{\beta} e^{\phi \cdot u_{ip-1}}$ is the Lagrange multiplier. The positive log-linear relationship between L and u still holds, albeit approximately, for a more general constant elasticity of substitution (CES) sales function specification, through a log-linearisation of the applicable first-order condition for labour input.

With capital and management inputs fixed and the trading environment exogenous, u_{ip-1} is uncorrelated with all the observed variables apart from log annual labour input ($\ln L_{ip} = \ln \left(\sum_{t=1}^{52} e^{l_{ipt}} \right)$). Therefore, we can develop a proxy for u_{ip-1} in the sales function by regressing annual labour input on the rest of the observed variables that are constant throughout the year ($\mathbf{x}_{ip}$),

$$\ln L_{ip} = \mathbf{x}_{ip} \times \mathbf{g} + \xi_{ip} \ . \tag{4}$$

We then use the residuals from this regression (ξ_{ip}) to control for last year's unexpected sales, u_{ip-1} in the sales function (equation (1)). What then remains of u_{ip} is annual random noise in sales, η_{ip}, which is orthogonal to all the regression variables, and which will be important in the manager pay equation in the next sub-section. Note from equation (3) that if the sales function is Cobb-Douglas, $\xi_{ip} \equiv \frac{\phi}{1-\alpha} \cdot u_{ip-1}$, and if it is CES, $\xi_{ip} \cong \frac{\phi}{1-\alpha} \cdot u_{ip-1}$, so that we can in any case gauge the persistency of the unobservable shock to sales (as measured by ϕ) from year to year.

Controlling for u_{ip-1} is important. Admittedly, our proxy for u_{ip-1} is ξ_{ip}, which is orthogonal to the rest of the regression variables in the sales equation (1) by construction, and so the estimates for all the other variables will not be affected whether we include it or not. Still, using u_{ip-1} allows us to estimate the autoregression parameter ϕ from equation (2) and thereby the annual random noise in sales (η) which will be important in the manager pay equation. In addition, as we explain below, the autoregression parameter ϕ allows us to investigate how much our regression results for management depend on the assumption that management input is exogenous to the store-specific unobservable term u.

We have learnt from management interviews some of the structural elements of the sales function we want to estimate. However, the function cannot be fully identified without accounting for store managers' effort. Because management ability requires effort to be brought out, we need to model a mechanism through which the company can provide incentives for its store managers. In fact, while incentives are "the essence of economics" (Prendergast, 1999: 7), no study of management in the context of a production function has yet internalised them in the modelling of the management-performance link. The next subsection outlines a variant of the standard performance pay model which describes a plausible incentive mechanism.

2.2 Store manager pay

We use a simple agency model of performance-related pay (drawing on Holmstrom (1979) and Holmstrom and Milgrom (1987)), which is reasonable given that store sales are an easily available measure of manager performance (problems with distorted measures are discussed in Baker (2002); see also Courty and Marschke (2003)). The model predicts that, when effort can only be monitored imperfectly (which is true for a geographically dispersed organisation such as ours), in order to induce the manager to exert effort, part of her pay must be conditioned on her output. In our case, salaries are mostly fixed at the start of the trading year and bonuses are too small to be economically important. However, as explained to us by the company's HR department, the company does take into account store managers' past sales performance, as well as the labour market situation, when reviewing manager contracts for the next trading year. This practice is tantamount to having explicit incentive pay contracts.

The model describes a one-period game between a risk-neutral principal (the company) and a risk-averse agent (the store manager). The agent produces output (y[1]) which depends on her effort (ϵ), observable to her only, ability (c), observable to both parties, and the annual random noise term (η), observable to none (all letter notations are the same as before, store subscripts are suppressed for simplicity),

$$\begin{aligned} y &= \eta \text{ if } \epsilon = 0, \\ y &= \epsilon + c + \eta \text{ if } \epsilon > 0. \end{aligned} \tag{5}$$

The manager receives a wage (w) from the principal which in part depends on the past period's output,

$$\begin{aligned} w = \alpha + \beta\eta \text{ if } \epsilon = 0, \\ w = \alpha + \beta(\epsilon + c + \eta), \text{ if } \epsilon > 0, \\ \alpha, \beta \geq 0, \end{aligned}$$

and maximises utility,

$$U(w, \epsilon) = E(w) - \delta \cdot \frac{\epsilon^2}{2} - \lambda \cdot \text{var}(w), \tag{6}$$

[1]There are, of course, other determinants of output, but since they do not depend on store managers (unlike c and ϵ) and are assumed to be observed to both parties (unlike η), we will abstract from them.

where parameters $\delta > 0$ and $\lambda > 0$ represent the cost of effort and aversion to uncertainty regarding the realised value of output. (Our assumption that delta is invariant with respect to management ability is admittedly heroic, but we test it below.) The optimum level of effort that the agent decides to exert is

$$\epsilon^* = \frac{\beta}{\delta}, \tag{7}$$

and she will work for the principal only when her utility given the effort,

$$U\left(w(\epsilon^*), \epsilon^*\right) = \alpha + \beta c + \frac{\beta^2}{2\delta} - \lambda\beta^2 \cdot \text{var}(\eta),$$

is at least as high as her reservation utility, $\bar{u}(\mathbf{z}, c)$ (the reservation utility is allowed to vary with ability c and other parameters $\mathbf{z}$ reflecting the outside options available to the manager, e.g., pay for similar occupations in the area).

The principal maximises

$$\Pi = E(y - w) = \epsilon + c - \alpha - \beta(\epsilon + c),$$

given the agent's reservation utility and effort, and derives the optimal wage contract as follows:

$$\alpha^* = \bar{u}(\mathbf{z}, c) - \frac{c}{1 + 2\lambda\delta \cdot \text{var}(\eta)} - \frac{1 - 2\lambda\delta \cdot \text{var}(\eta)}{2\delta(1 + 2\lambda\delta \cdot \text{var}(\eta))^2},$$
$$\beta^* = \frac{1}{1 + 2\lambda\delta \cdot \text{var}(\eta)}, \tag{8}$$

implying

$$w = \bar{u}(\mathbf{z}, c) + \frac{1}{2\delta(1 + 2\lambda\delta \cdot \text{var}(\eta))} + \frac{1}{1 + 2\lambda\delta \cdot \text{var}(\eta)} \cdot \eta. \tag{9}$$

Equations (7) - (9) allow us to make several observations regarding the assumed behaviour of the principal and agent, as follows. First, if there is no incentive pay (i.e. $\beta = 0$) the agent will make no effort at all; if, however, there is incentive pay it is always optimal for the agent to exert some effort. Second, the model predicts that the extent of incentive pay, β^*, and the exerted effort, ϵ^*, are the same for all managers; and therefore, given all other determinants, sales vary only due to ability and random noise (η) which we estimate from the sales equation[2]. (A slightly more complex model in Schaeffer (1998) results in ϵ^* also being dependent upon store size; we control for this possible dependency in robustness checks below.) Third, the incentive part of manager pay (fraction times η in equation (9)) depends not on observed output, but on unexpected output (η), because the observed components of output are absorbed by the fixed wage component and profit.

2.3 Estimation issues

Following Black and Lynch (2004) and Bloom and Van Reenen

[2]This implication does not hold for other specifications of the output equation (5). For example, assuming $x = \epsilon \cdot c + \eta$ results in ϵ, α and β being nonlinear functions of c. We do a robustness check of the results derived under equation (9) (see Table 7), but find no significant difference in the coefficient estimates for η between different KBI grades, and hence no evidence to reject our simple specification.

(2007), we start by assuming our sales function (1) to be Cobb-Douglas. However, the Cobb-Douglas is a rather restrictive specification because it assumes constant elasticities of output with respect to inputs and unit elasticity of substitution between any two inputs, both of which assumptions may be questionable. Having more than 10,000 observations of sales and labour input we can relax these restrictions. So we estimate a translog sales function as follows:

$$y_{ipt} = \sum_{k=1}^{K} \alpha_k z_{kipt} + \frac{1}{2} \sum_{k_1=1}^{K} \sum_{k_2=1}^{K} \alpha_{k_1 k_2} z_{k_1 ipt} z_{k_2 ipt} + u_{ip} + e_{ipt}, \qquad (10)$$

where K is the total number of variables in vector $\mathbf{z}$ (which includes l, s and $\mathbf{x}$ from equation (1)), and $\alpha_{k_1 k_2} = \alpha_{k_2 k_1}$. The translog is an approximation to a large class of production functions (Christensen *et al.*, 1973), imposing few restrictions on the curvature of the production possibility frontier. In our case, a translog specification of the sales equation fares better than Cobb-Douglas. Although the two competing specifications produce similar estimates for the key regression variables, the translog shows higher overall significance, so we prefer it.

Working with weekly data for sales and employment, it is important to allow for gradual adjustment of actual sales to their predicted level. We therefore introduce lags of the dependent and explanatory variables in the regression equation (10), which, after replacing u_{ip}

with $\phi \cdot u_{ip-1} + \eta_{ip}$ (equation 2) and some reparameterisation, becomes

$$\triangle y_{ipt} = \sum_k \alpha_k \triangle z_{kipt} + \frac{1}{2} \sum_{k_1} \sum_{k_2} \alpha_{k_1 k_2} \triangle z_{k_1 ipt} \triangle x_{k_2 ipt} - (1-\gamma) \cdot M + v_{ipt}, \tag{11}$$

where $M = y_{ipt-1} - \sum_k \beta_k z_{kipt-1} - \frac{1}{2} \sum_{k_1} \sum_{k_2} \beta_{k_1 k_2} z_{k_1 ipt-1} z_{k_2 ipt-1} - \phi \cdot u_{ip-1} - \eta_{ip}$. Here the αs are the instantaneous, and βs are the "long-run" effects of the model variables on sales, $1 - \gamma$ measures the speed of adjustment of the actual sales to their predicted level, and v_{it} is an idiosyncratic, serially uncorrelated error term. As discussed earlier, we proxy the last year's unexpected sales, u_{ip-1}, with the residuals ξ_{ip} from the total annual labour input equation 4.

Following Black and Lynch (2004) and Bloom and Van Reenen (2007), we estimate equation (11) in two steps. First, we obtain estimates ($\hat{\alpha}$s, $\hat{\beta}$s and $\hat{\gamma}$) for the time-varying variables (weekly labour input, week dummies, lagged dependent variable) and recover store fixed effects (which at this stage include $\mathbf{x}$, the proxy for last year's unexpected sales, ξ_{ip}, and the annual random noise term, η_{ip}). At the second step, we regress the store fixed effects on the $\mathbf{x}$ and ξ_{ip}. We calculate the input elasticities at the means of the respective variables, for example

$$\partial y / \partial z_k = \beta_k + 2\beta_{kk} \bar{z}_k + \sum_{\kappa \neq k} \beta_\kappa \bar{z}_\kappa.$$

The standard errors for the elasticities are computed from Monte Carlo simulations, given the regression coefficients' point estimates and variance-covariance matrix.

As in Bloom and Van Reenen (2007), we instrument labour input to control for biases due to simultaneous determination of inputs and output by an unobserved process (see Blundell, Bond and Windmeijer (2000) for a more detailed discussion of input simultaneity), using lags of labour input from 2 to 5 as instruments, but find that instrumentation makes little difference to the estimates. Using data from a single company helps ensure that time-varying unobservables are the same for all stores and thus can be captured by the week dummies, so that simultaneity is not so much of a problem in our data. Also, we do not need to instrument the lagged dependent variable, because the bias to its estimate due to correlation with the store fixed effect is negligible in long (52 weeks) panels, such as ours. We also test for autocorrelation in the first-step residual, v_{ipt}, finding which would imply an incorrectly specified model because in that case $cov(v_{ipt}, y_{ipt-1}) > 0$, contrary to the assumption of orthogonality between the error term and regression variables. Our preferred translog specification passes this test.

It only remains to estimate the store manager wage equation (9). Assuming the manager's reservation utility to be log-linear in its arguments, we regress log total salary on manager ability and practices (the KBI's), store and area characteristics, and, following our incentive pay model, the annual random noise term, η, which is the time-invariant component of the residual from equation (11). A finding that the estimate for η is significant would confirm the existence of an incentive mechanism for store managers. However, it may be the case that not the entire annual random noise term is relevant for manager pay. We cater for this possibility by experimenting with its "technical inefficiency" component which is relatively more prevalent when sales expectations are not met. Indeed, we find that contracting on technical inefficiency, rather than the full η, gives a slightly better representation of the manager pay determination process.

In summary, our estimation procedure relies on linking the results of different equations. First, the residual ξ_{ip} from the labour input equation (4) is used as a proxy for the last year's unexpected sales, u_{ip-1}, in the sales equation (11). Then the time-invariant error term from equation (11), η, is used in estimating the manager pay equation (9). This linking, based on simple theoretical arguments (the AR(1) process for unexpected sales, which is consistent with the company's wage budget practice, and the incentive pay model), ensures that our estimation procedure is internally consistent.

3 The data

Our analysis runs through the data collected for the trading year February 2005 to February 2006. The reason for taking only one year's worth of observations is to ensure that the same manager was in charge of a given store for the entire study period. All managers who participated in the survey must have been running their stores for at least a year as of February 2006. There are 245 such stores.

Our data come from a number of sources. Company accounting records provide weekly data on sales (our dependent variable) and hours worked (our measure of labour input), as well as sales assistant and store manager characteristics (age, gender, contract hours, dates hired and left, turnover, pay). The data on management ability come from the company's in-house survey run by its HR department (see below).

We also use area data which include average hourly earnings by occupation (from the UK Quarterly Labour Force Survey), the unemployment rate and the number of competitors in the local area. The data on competitors come from the company's own survey of stores with the same main business and situated within a given store's catchment area. Finally, we use the following store characteristics: space (our measure of capital input), location, brand, and share of children's products. With a few observations missing or discarded (e.g., store being temporarily closed), the resulting dataset contains 12,671 complete observations for 245 stores over 52 weeks.

3.1 Descriptive statistics

Table 1 summarises our data, beginning with store characteristics. The average store is, in UK terms, comparable to a small enterprise, employing 314.5 worker-hours of labour a week (8.4 full-time-equivalent (FTE) workers, 1 week = 37.5 hours), and occupying about 150 square metres of space. Hence, we take our dataset as enabling an analysis of some 245 small enterprises. At the same time, despite the fact that they are all part of the same company, selling the main brand of medium-priced casual clothing and generally located in large shopping centres, our enterprises vary considerably in productivity. As can be seen the standard deviation of productivity across stores is £15.07, giving a coefficient of variation relative to mean productivity of 25% (=15.07/59.93). It is this high variation in productivity – which is persistent (Siebert and Zubanov, 2008) – that we aim to understand.

[Table 1 about here.]

Our organisation needs to accommodate large fluctuations in business by season and day of the week, which requires a flexible workforce. Indeed, most of the sales assistants work less than 15 hours per week. There is also high employee turnover (FTE quit rate = 0.15, hiring rate = 0.08), characteristic of the retail sector. But such fluid conditions present a challenge to the store manager who must match labour input to fluctuating demand while keeping turnover under control.

The average area pay and unemployment are in line with the national averages. Competitive pressure, however, varies quite dramatically, averaging at a rather high level, 36.45 stores in the catchment area. High competition is thus another challenge store managers must face.

As for store managers, we see that an average manager is in her late 30s, and has worked for the company for a considerable part of her working life (indeed, many were recruited from the ranks of the sales assistants). Most of the managers are women, but the share of men (0.27) is twice as high as for sales assistants. Their average pay rate in 2006 (£11.24 per hour) exceeds that for similar occupations in the area (£11.06 per hour) – unlike that of sales assistants. (Note that the manager pay data are for 2006, one year after the sales data.)

The variance in manager pay is large when compared, for example, with the variance in store assistant pay. Thus the coefficient of variation for manager pay is 23% (=2.59/11.24), compared to 5% (=0.23/5.02) for store assistants. This variance in fact parallels the variance in sales per hour (coefficient of variation=25%), and reflects significant differences in how much our organisation values its store managers. It is true that a source of this variation might be differences in regional economic conditions. However, variation in the managers' pay by Labour Force Survey region (twenty-one in total) explains only about a quarter of the total, suggesting other important sources of variance such as store performance and/or management ability. In fact, we see that bonuses are small, averaging only 2.8% of salary. But bonuses need not be the only form of incentive pay. As noted above, each store manager goes through an annual salary review where her salary is determined taking past sales performance into consideration – consistent with the model of manager pay that we use.

3.2 Key Behavioural Indicators

All managers who had worked in their stores for at least one year as of early 2006 were surveyed. This minimum tenure restriction ensures that every store manager has enough evidence for their performance to be adequately assessed. The survey, produced by the company's Human Resources department, contains twenty-eight questions covering six management practice areas, or key behavioural indicators (KBIs): sales focus, commercial awareness, developing people, drive and personal development, leadership, and planning and organising. It took a dedicated HR team, store and area managers five months to collect, verify and summarise these data.

Each store manager had first to fill in the survey questionnaire. Those self-assessments were later discussed with the area managers, and then, based on the evidence supporting the self-assessment results, agreed assessments were produced. There were three assessment grades for each characteristic: development need, capable and strength. The descriptions of the grades – the same for all stores – correspond to inadequate performance, performance up to the minimum standard required by the company, and performance above the standard. The agreed assessments were later grouped, and the aggregate grades for each of the six KBIs were produced. We were granted access to these aggregate grades. An overall management grade can also be calculated, as a weighted average of the six KBI grades. 0.82% of the sample achieved the highest overall grade, A; 14.3% a B; 65.3% a C; 14.7% a D; and 4.9% an E. The actual descriptions of each KBI are reported in Table 2.

[Table 2 about here.]

As can be seen from Table 2, the KBI survey is broad, covering an extensive range of practices, from the more administrative (such as planning and organising) to the more entrepreneurial (such as commercial awareness). Admittedly, there are overlaps, for example, both sales focus and leadership reward team building. At the same time, the important commercial awareness KBI appears to be unique. It emphasizes monitoring local competition, adjusting manpower subject to the wage budget constraint, and making the best use of space on the sales floor - none of which are touched on by the other KBIs. As we will show by comparing the estimates for the KBIs entered separately and jointly into the sales equation, it is the characteristics of commercial awareness that matter for productivity.

Table 3 shows that the performance of store managers with respect to the KBIs varies considerably. About 20% were rated as development need for sales focus, commercial awareness, leadership and drive and personal development, and around a quarter were rated at the highest grade. The best-performing KBI is planning and organising, in which 95% of the store managers achieve satisfactory performance. The weakest results are for developing people, with 40% of store managers underperforming.

[Table 3 about here.]

The KBI grades are predictably correlated with store size and manager salaries. Managers with a higher grade are found in larger stores, in more competitive areas, employing more people and receiving higher pay. Average labour productivity too tends to increase with the KBI grade. In the next section we apply a more rigorous analysis to these observations.

4 Regression results

4.1 Store sales

Table 4 reports the main regression results for our preferred translog specification of the sales function (equation 10). The regression produces plausible estimates and shows high overall significance. The input elasticities are meaningful, implying returns to scale of 0.765. That returns to scale are less than 1 makes economic sense, because there are other inputs in particular management.

[Table 4 about here.]

The translog specification reveals the short-run dependency of the labour input elasticity on the time of the year, store space (coefficients not shown) and, most importantly, store manager. Thus, managers with higher grades for the planning and organising KBI achieve a higher labour input elasticity in the short run - presumably as a result of their better ability to mobilise labour at times when its efficiency is the highest. However, this effect is not preserved in the long run, unlike other effects of management, as follows.

Looking at the KBI grades, we enter them separately and jointly with the aim of detecting overlaps and finding which is the most important. Most KBIs are individually significant, but commercial awareness is is the largest. As we see, only the KBIs for commercial awareness and leadership retain significance when entered jointly. This result indicates significant intercorrelations between different KBIs, presumably as a result of overlapping definitions. That said, evidently it is the special characteristics of commercial awareness which are important for productivity, since its coefficients are similar whether entered separately or jointly. As noted above, these characteristics consist mainly of entrepreneurial skills, such as monitoring local competition and making the best use of resources subject to the wage budget rule.

Store managers rated capable for commercial awareness achieve 11% higher annual sales than their colleagues with grade development need, and those with grade strength achieve 17% higher sales. All else equal, these differences in sales mean the same differences in labour productivity between stores. Thus, given our interpretation of the grade capable as defining the minimum appropriate performance, the contribution of commercial awareness practices to productivity is 11%, and the contribution of management ability beyond fulfilling the minimum practice is 6% (=17-11).

Another KBI, leadership, also makes a difference to productivity. Managers with grade capable for this KBI are 6% more productive than those with a development need; but there appears to be no further improvement in productivity associated with extra ability on this KBI. Other KBIs are insignificant.

The signs on other control variables are consistent with conventional economic reasoning. Thus, having more workers on short contract hours enters positively (0.19 to 0.28), presumably because such workers create a flexible workforce, leading to higher productivity when demand is turbulent. Paying higher wages relative to competitors' enters positively (0.69) because better quality workers are attracted. Sales tend to be higher in wealthier areas, and also where there are clusters of competitors.

Finally, we observe that shocks to sales are quite persistent. About 40% $(1-(1-\gamma))$ of the last week's shock to sales carries over to the current week. Also, recalling equation (4), we calculate that, given the estimate for ξ_{ip} (0.68) and the long-run labour input elasticity of 0.44, the autoregression parameter ϕ for the unobservable shock to sales is around 0.4 (=0.68*(1-0.44)). The latter result suggests significant persistency of store-specific unobservables in the sales function, a result which better enables us to see what happens if we no longer assume exogeneity of management inputs in the sales equation (see below).

4.2 Store manager pay

Table 5 reports the regression results for log store manager total annual pay in 2006. Most important, the annual random noise term for sales (η) is a significant determinant of pay, which is consistent with the predictions of our incentive pay model (equation (9)). The 0.2 elasticity result confirms that pay varies less than one-to-one with sales, implying that managers do not receive their exact marginal product of labour. Rather, being risk-averse, they surrender part of the windfall pay in a lucky year (when $\eta > 0$) as an insurance against their loss of income in a bad year ($\eta < 0$). Thus, a standard deviation change in η of 11% (see Table 4 for σ_η) causes a 2.2% change in a store manager's pay (about £460 on average, given annual pay of £21,000).

[Table 5 about here.]

Table 5 also shows the effects of other determinants of manager pay. We see that pay is higher for male store managers, and for those living in areas with higher pay and more competitors – presumably reflecting the more generous outside options available to them. Managing more workers attracts a premium as well, which is consistent with the greater difficulty of running a larger store, and the extra responsibilities that come with it.

At the same time, we do not find a strong correlation between pay and most of the KBIs. This finding holds whether or not we control for other determinants of manager pay, in particular store workforce size and space which may also link with management ability. The implication is that the KBIs measure a type of company-specific middle management ability which raises sales in company stores (Table 4), but which is not easily tradable on the outside labour market.

4.3 Robustness checks

We have already mentioned that our main regression results are robust to the type of the sales function (Cobb-Douglas or translog) and input endogeneity. Here we report the results of extra checks of the robustness of the regression results for productivity and manager pay to a selection of alternative specifications. Tables 6 and 7 report the results based on the uninstrumented translog specification of the sales equation (11). Basically, we find that most of our main regression results are quite robust, although looking at our data from different angles does lend some extra insights.

Store sales. First we address the issue of measurement error in the KBIs (specification **I** in Table 6) which might have caused some of the KBIs to be insignificant. Bloom and Van Reenen (2007) find that the variance of their management scores due to measurement error is from 25% to 42% of the total (p. 1366). We do not have two or more independent observations for the same manager, so we cannot correlate their results to estimate the extent of the measurement error. Still, we can at least partially control for measurement error by including in the sales equation the "noise controls" which might be correlated with KBI measurement errors, even though they are probably irrelevant to sales.

[Table 6 about here.]

We have some noise controls already in the equation. First, the KBIs control each other because their measurement errors are correlated. Second, the area manager dummies, which are rarely significant on their own, should account for biases in the judgement of the area managers who interviewed the store managers. Indeed, excluding the insignificant KBIs and area manager dummies from the equation reduces the estimates for commercial awareness somewhat, reflecting the attenuation bias introduced by measurement errors in this important KBI.

In addition to the existing noise controls, we use manager age, gender and experience with the company. The inclusion of these variables leads to a small increase in the estimates for commercial awareness compared to Table 4, as expected. At the same time, it must be remembered that the extent of measurement error in our data is likely to be much smaller than in the average postal or telephone survey (the KBI survey was compulsory and store managers were required to supply evidence to back up their responses), and is further reduced by having only a few grades of management ability.

We next focus on controlling for residual heteroscedasticity by allowing the variance of random noise η to vary with workforce size (specification **II** in Table 6). Here we find some negative correlation between residual variance and the workforce size, implying that sales in larger stores are somewhat more predictable, but, again, our main regression results remain robust to this specification.

Finally, we introduce additional management variables – dummies for the overall management grade (specification **III** in Table 6) and bundles of KBIs with the same grade or higher (specification **IV**) – to see if there is a joint effect of several KBIs not captured by their individual estimates. There is some evidence that sets of different abilities matter beyond their individual components, supporting the management practice complementarity view (Macduffie 1995; Ichniowski, Shaw and Prennushi 1997). However, the overall effect of management bundles is not as important as that of individual KBIs (see next section for some quantitative illustrations). The complementarity effect appears to be particularly strong for the star managers with an overall grade A, bringing an extra 20% improvement in labour productivity; but with such a small share of these managers in our sample (less than 1%) this result must be taken with caution. For the majority (80%) of managers with grades B or C there is virtually no difference in performance by grade. It is only the minority (19%) of managers with grades D or E who appear to be doing worse than the rest, but even then the difference is on the brink of statistical significance.

Store manager pay. We have experimented to ascertain whether the insignificance of the KBIs in the pay equation 8 is a result of (over)controlling for average pay in the area, or store size. However, the KBIs still remain insignificant even after these variables have been excluded, while the other estimates stay virtually unchanged. Thus, our earlier conclusion remains, that the market for management ability, as measured by the KBIs, is limited.

We further check the robustness of the manager pay regression results by running equation (9) on sub-samples formed by each grade of commercial awareness, and by stores with lower than expected ($\eta < 0$) and higher than expected ($\eta > 0$) sales (Table 7). The estimates for the determinants of store manager pay are fairly robust to sub-sampling from the overall sample. There is no strong evidence to suggest that the main determinants of pay – actual vs. expected sales (η), area average pay for a similar job, workforce size, and manager gender – differ in their effects by grade of commercial awareness (see the first of the "test equal p-val." columns in Table 7). Therefore, our simple specification of the output equation for the incentive pay model (equation (5)) with additive effects of effort, ability and luck is consistent with the data.

[Table 7 about here.]

One challenge to our interpretation of the annual random noise in sales variable η is that the estimates for it differ depending on whether the store under- or outperforms on the sales target. Thus, there are indications that the extent of incentive pay for the unlucky managers (sub-sample of $\eta < 0$, column 6 of Table 7) differs significantly from that for the lucky ones (sub-sample of $\eta > 0$), which goes against the prediction of the model that the extent of incentive pay should be the same regardless of the actual realisation of η[3].

Perhaps instead of η we should be looking for a component of the random noise which is relatively more prevalent when sales expectations are not met. The theory of stochastic production frontiers (Kumbhakar and Lovell 2000) identifies such component as technical inefficiency, a measure of failure to use the available resources at their most productive, and offers a choice of techniques of separating it from a purely random noise.

We have tried several estimation methods for the technical inefficiency component, and found that, when included in the pay regression, it works in the direction expected and, in particular, is symmetrical for both lucky and unlucky managers. Its elasticity is about -0.8, implying a 2% drop in salary with every one-standard-deviation increase in technical inefficiency (almost the same magnitude as for η). So, it is not simply the difference between the actual and expected sales that affects store manager pay, but the technical inefficiency component of it – however, in practice, the distinction is not important.

Causality or association? Does variation in management cause variation in sales? As in many studies, the interpretations of our main findings rest on the assumption that the link between the KBIs

[3]Allowing for β_1 for $\eta < 0$ and β_2 for $\eta > 0$ will still give $\beta_1 = \beta_2 = \beta$. Any difference between β_1 and β_2 is not profit-maximising, as it will have to be compensated by a higher fixed component of the wage (α).

and sales is causal. We cannot test this assumption directly because our management variables are time-invariant. However, we propose the following argument for the causal nature of our regression results with respect to management.

If the positive management-productivity link is not causal, there exists a third, unobservable, factor which determines productivity and management input simultaneously (here we assume away reverse causality). For example, a store located in a wealthy area may both have high sales of clothing, and a supply of responsible, business-like people who make good managers. This simultaneity will drive our estimates of the impact of management upwards from their true values. We can allow for simultaneous determination of sales and management by re-specifying the proxy for the last year's unexpected sales, u_{ip-1}, as the residual from the annual labour input regressed on all the observed variables *except* management (see equation (4)). Then ξ_{ip}, the proxy for u_{ip-1}, will no longer be orthogonal to the KBIs, as the causality assumption would imply, but instead the two would be positively correlated, as simultaneity would have them be, resulting in lower estimates for the KBIs than in our main specification (Table 4). That the last year's unexpected sales appear to be important for this year's productivity better enables us to perform this manipulation, because, had ξ_{ip} been not significant in the sales equation, the results for the KBIs would be the same regardless of simultaneity.

Indeed, using the re-defined proxy in the sales equation 10 with noise controls for management results in lower estimates for grades capable and strength for commercial awareness: 0.071 and 0.118, respectively; and leadership loses significance altogether. Ichniowski *et al.* (1997) and Bartel (2004) report the same tendency after introducing fixed effects to account for unobservables. In our case, however, the above coefficients are likely to be underestimates of the true casual effect, since they are obtained under the assumption that the annual labour input does not depend on store management, which is unlikely to be the case (cf. Lucas, 1978). At any rate, a large part of the effect of management on sales survives even after (over)controlling for simultaneity.

5 Discussion

5.1 Management and productivity: some illustrations

We find that the most important KBI is commercial awareness. Variation in commercial awareness is responsible for a sizeable portion of variation in productivity. We find that moving from the bottom quartile of the distribution of commercial awareness (i.e., development need, 18% of the sample) to the top quartile (strength, 26%) is associated with a 17% improvement in labour productivity. The interquartile productivity range is 40%, so the interquartile range in commercial awareness accounts for 43% (=17/40) of that in labour productivity. Continuing to assume the cost of sales to be a constant fraction of sales, we calculate the interquartile TFP range at 52%; so, commercial awareness accounts for 33% of variation in TFP.

Good management brings substantial economic benefits, which is easy to calculate having the distribution of managers by grade and productivity differences between different grade managers. Thus, given our regression results for the KBIs and the distribution of labour between managers of different grades, if all managers had a development need for commercial awareness, the total annual sales in 2005 would be 11.5% (£27.54 million) lower than actually observed. Company-wide organisational management practices also help bring out the benefits of good store management. Our results allow us to calibrate the effects of two of such practices. One is allocating better managers to bigger stores (see Table 3). If all managers had stores of the same size, the total gains in labour productivity would be 10.5% instead of the 11.5% reported above.

The other practice is incentive pay contracts. The difference between the productivity results for the capable and strength managers is significant (17%-11%=6%), pointing out the importance of management ability beyond the fulfilment of the minimum appropriate practice requirements. If there were no incentive pay, there would presumably be no need to exert more effort than was required to satisfy the minimum, in which case the average labour productivity would be 2.35% less than observed (=0.06, the difference in productivity between strength and capable, times the fraction of the workforce that the strength managers control, 40%).

Still, there is a potential to increase labour productivity by exploiting the existing pool of store managers, as well as improving its quality through searching for, developing and rewarding talented individuals. Thus, coaching the underperforming store managers so that they can fulfil all the practice requirements under commercial awareness to attain grade capable would bring an extra 2% gain in sales (=18%, the share of managers with a development need, times 11%, the estimated increase in productivity from a development need to a capable). Furthermore, if all managers were strength, the total sales would be 6.4% higher (=18% times 17%, the difference between a development need and a strength, plus 56%, the share of managers with a capable, times 6%, the difference in productivity between a capable and a strength).

5.2 Our results and other studies

Our findings about the importance of store management are consistent with the literature. Since store managers are hard to allocate among stores in the short run, our results help explain part of persistent inter-workplace differences in productivity documented in the earlier literature (Bartelsman and Doms, 2000; Griffiths *et al.*, 2006).

It is also instructive to compare our quantitative findings for management with those in the studies closest to ours. Our estimate of the share of the interquartile range of TFP explained by management, 33%, is somewhat higher than Bloom and Van Reenen's (2007) 10-23%. We propose two explanations for this difference. First, in a cross-company study, such as theirs, it is harder to control for company-specific factors affecting the relationship between management and productivity. As a result, this relationship may be blurred by "contingent management" (pp. 1371-4). Second, the blurring may occur through combining many management practices, some of which are irrelevant to productivity, into one z-score, which makes for a noisier management regressor and an attenuated regression estimate. Thus, when we put grades from all the KBIs into a management z-score its estimate becomes 0.048, and its interquartile movement is associated with only a 6% movement in productivity, thereby accounting for only 6/52=12% of interquartile TFP range.

At the same time, if aggregating individual practices into a z-score reduces the importance of management due to attenuation bias, the question arises as to why our estimate of the share of interquartile productivity range explained by management (43%) is close to Griffiths *et al.*'s (2006) 40%, which they derive from the management score aggregating over 11 positions. The reason seems to be fewer controls used in their study, a possibility they do anticipate (p. 523). Thus, when we control only for labour input (as they do), the interquartile movement in our management z-score explains nearly 70% of interquartile productivity range, and "commercial awareness" together with "developing people" accounts for 75% of productivity's 90/10 range. Clearly, the degree of detail in management data and statistical controls are equally important for the quantitative results of a management study.

We have also accounted for the interrelation between competitiveness, management ability and productivity, which is an important theme in the literature on management and performance (Nickell, 1996), by controlling for the number of competitors in the catchment area. We find a positive correlation between KBI grades and area competitiveness, as did Bloom and Van Reenen (2007: 1389). Coupled with the positive impact of management on store sales performance, this finding supports the view that competition improves economic performance by "weeding out" the bad managers (Griffiths, 2001; Syverson, 2004). However, controlling for management, there is also a large independent effect of competition in the area, implying that better management is not the only channel through which competition improves economic performance. Thus, in addition to toughening the selection of managers, competition may proxy for the effects of area unobservables (e.g., agglomeration effects) on productivity.

While most of our findings on management are consistent with the existing literature, that managerial ability in developing people is insignificant seems to contradict the many studies showing the importance of HRM practices for firm performance (e.g., Ichniowski *et al.*, 1997). But this finding should be taken in the context of our organisation. Clothing retail is a turbulent business with predominantly part-time sales assistants who are normally unskilled and inexpensive to replace. In such an environment it is hard to develop a rationale for comprehensive, long-term relationships between store managers and sales assistants, and so the lack of significance of developing people for manager pay is reasonable.

Turning to the manager pay results, our 0.2 estimate of the elasticity of pay wth respect to unexpected sales is broadly similar to the estimates of Murphy (1986) 0.14, Barro and Barro (1990), 0.17, and Conyon and Murphy (2000), 0.12 for the UK and 0.27 for the US, for the elasticity of CEO compensation to share returns. Admittedly, there are limits to which we can compare the results from such different regression specifications. But, noting that the annual random noise to sales η may be regarded as a gross unexpected return to assets, it is reassuring that our estimate of the key incentive pay parameter appears to be broadly consistent with those previously reported.

Our results fit with the literature even more closely when it comes to the elasticity of manager pay with respect to firm (store) size. Our 0.29 estimate is well within the range of estimates reported: 0.22 for UK and 0.41 for US firms (Conyon and Murphy, 2000); 0.32 for US banks (Barro and Barro, 1990); and 0.25 for Canadian publicly traded firms (Zhou, 2000). This range is quite narrow, considering differences in samples with respect to time, country and industry. That the estimates are so close has long been a puzzle (Rosen, 1992).

Finally, our finding that the pay system does not reward manager ability (i.e., commercial awareness) as such is surprising. Still, this finding can be explained in terms of the market for local managerial talent being limited, an argument which has been advanced before (e.g., Huselid, 1995: 668).

6 Conclusions

In this paper we have looked into the black box of the management input in the production function of a firm. We have had to confine ourselves to the short run, the trading year, when selection and development of managers, and allocating them among stores is given. Within this year, we have found what middle management practices actually affect sales and productivity in competitive profit-maximising environment, and how company monitoring and incentive pay policies direct this management input. Ours is one of the few studies concerning the important middle management tier (most others concern CEOs), and this is a line of research we hope will be pursed further. Let us consider our findings in turn.

Our data are based on an accurate company survey of management practices and ability. The practice we found most important is commercial awareness encapsulating entrepreneurial skills, such as monitoring local competition and making efficient use of available resources. The KBI developing people, in this type of retail organisation, with high-turnover sales staff, is not important as might be expected.

The total gain in productivity associated with commercial awareness is 17%, and it explains 33-43% of the interquartile difference in productivity, depending on the measure. We argue that part of the impact of commercial awareness (11%) is due to the practice itself, and part (6%) to superior management ability in carrying out the practice. Different company policies are presumably applied to secure each of these effects. Monitoring the correct implementation of commercial awareness practices secures the 11% part of the gain, and the further 6% comes from incentivising the store managers with an appropriate pay system.

As for the workings of this manager pay system, we show that the term for unexpected annual sales (η) is a significant and economically important determinant of pay. The process of salary review apparently works to give an expected sales value for the year for the manager in her store (which we assume is determined by the sales function we estimate), and positive/negative deviations are proportionately rewarded/punished. This finding is consistent with the agency model of asymmetric information, coupled with risk aversion among managers.

The contrasts between our pay results for middle managers and those from studies of CEOs are noteworthy. Our 0.20 estimate of the elasticity of middle manager pay with respect to unexpected sales is similar to that from CEO studies. There is also a similar size elasticity. Both results suggest that similar incentive mechanisms are at work at the middle as well as the top of the management hierarchy. On the other hand, we find that abler managers do not receive higher pay all else equal. The implication here is that middle management ability is more specialised and less tradable, unlike CEO ability, where the market is more open. This finding will explain why companies hire their CEOs on the open market, yet develop their middle management resources in-house – as a source of competitive advantage which cannot easily be bid away.

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Table 2: Key behavioural indicators.

KBI & components	Capable	Strength
I. *Sales focus*		
1. Maintains high operational and visual standards.	Delivers the company operational and visual standards to drive sales performance.	Generates a passion for high operational and visual standards in everyone. Store consistently delivers high standards.
2. Uses company initiatives to increase sales.	Makes sure all training and selling initiatives are delivered.	Gains commitment from all team members so that training and selling initiatives become properly embedded.
3. Exhibits and develops selling skills within the team.	Displays thorough product knowledge and effective selling skills. Flexes selling conversations according to consumer types.	Can role model excellent selling skills. Observes performance on sales floor, gives feedback and recommendations for improvement.
4. Uses reports and information to improve sales performance.	Reviews and analyses reports and sales information to improve performance.	Uses information to identify additional selling opportunities.
5. Uses knowledge of fashion trends to enhance sales performance.	Keeps up to date with fashion trends, can relate them to products and uses this knowledge in selling.	Develops in others a knowledge of fashion trends and an ability to incorporate this when selling.
II. *Commercial awareness*		
1. Aligns own plans to business priorities.	Makes plans for peak trading periods to ensure effective use of resources.	Knows the trading period strategy and uses it to identify priorities and determine plans which will provide the best financial results.
2. Uses knowledge of products to maximise business performance.	Knows the performance of all departments and key products within each of these.	Makes the best use of space on the sales floor given the store's product mix.
3. Delivers controllable costs.	Can manage payroll and puts plans to deliver wage control.	Is flexible and can adjust manpower to deliver a great experience for customers while achieving the wage control targets.
4. Observes own and monitors competitors' activity.	Constantly reviews the store through the eyes of a customer and makes adjustments to improve the shopping experience.	Monitors local competitors and considers shopping experiences in other retailers to make improvements in own store.
III. *Leadership*		
1. Is a positive role model.	Behaviour and work of a high professional standard. Respected by colleagues.	Is a highly credible role model, an inspiration for others.
2. Is an effective communicator.	Sets clear expectations of performance standards. Communicates information clearly and concisely.	Listens and responds well. Encourages sharing of ideas. Adapts the style of communication to build rapport.

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Table 2 – Continued

KBI & components	Capable	Strength
3. Builds winning teams.	Encourages a sense of friendly competition and cooperation. Praises and recognises good performance.	Generates a positive 'buzz'. Coaches and motivates the team to succeed while maintaining good working relationships.
4. Makes sound decisions.	Can be relied on to make decisions right for the store and the business.	Makes excellent decisions and considers their immediate and long-term impact. Puts plans in place to overcome potential barriers.
5. Managers poor performance.	Takes appropriate and timely action to address poor performance.	Differentiates between conduct and capability, identifies the root cause of poor performance and manages it accordingly.
6. Deals with and resolves problems.	Can deal with problems, seeks advice when needed to resolve them.	Tackles problems in their early stages and can make sound decisions to resolve them objectively.
7. Manages change.	Reacts to change positively and sells the benefits to the team.	Puts plans in place to implement change successfully. Deals with resistance in a positive way.
IV. *Developing people*		
1. Uses company recruitment and induction practices.	Follows company procedures in recruitment. Provides induction to new hires.	Has a good working knowledge of recruitment practices. Follows up all inductions to ensure their effectiveness.
2. Uses training to continuously improve performance.	Ensures everyone complete standard training requirements. Keeps training records up to date.	Identifies training need and uses available materials to deliver effective training.
3. Uses feedback to improve performance.	Gives genuine praise and constructive criticism to improve performance.	Consistently uses feedback to enhance performance.
4. Completes performance development reviews.	Ensures all employees attend one review meeting each year to agree on business goals and identify development opportunities.	Follows up the formal performance review with informal reviews of the agreed goals and development activities.
5. Develops people for the future.	Identifies and develops individuals who demonstrate potential and a desire to progress.	Has a succession plan in place and develops talent so that positions can be filled internally.
V. *Drive and personal development*		
1. Is committed to company standards.	Shows commitment to achieve agreed performance standards.	Strives to exceed performance standards.
2. Is motivated to succeed.	Demonstrates passion and enthusiasm, is motivated to succeed.	Is a self-starter, consistently passionate and shows dedication to the task.
3. Responds to challenges positively.	Maintains a positive outlook and responds to challenges well.	Demonstrates a 'can do' attitude. Is resilient under challenging circumstances.
4. Takes responsibility for own development.	Maintains a personal development plan. Can demonstrate improvements in skills, knowledge and behaviour over time.	Looks for opportunities to enhance skills and knowledge. Shows initiative to improve self.

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Table 2 – Continued

KBI & components	Capable	Strength
VI. *Planning and organising*		
1. Plans in advance.	Uses company materials to plan in advance.	Plans ahead on a daily and weekly basis and carefully considers forthcoming trading periods.
2. Prioritises tasks.	Considers tasks according to importance and urgency. Understands the difference between 'must do', 'should do' and 'nice to do'.	Prioritises logically and according to maximum business benefit.
3. Delegates effectively and meets deadlines.	Delegates tasks and follows them up to ensure deadlines are met.	Delegates appropriately and takes time to put tasks into context. Monitors progress so that deadlines are met.

Source: survey documentation, minimal editing applied.

Note: A "development need" was given for sub-standard performance.

Table 1: Descriptive statistics.

Variable	**obs.**	**mean**	**std. dev.**
Store characteristics			
sales per hour worked	12671	59.93	15.07
total hours worked per week	12671	314.48	211.76
store space in square meters	245	148.98	82.47
store belongs to: main brand	245	0.93	0.26
other brands	245	0.07	0.26
store location: stand-alone, city centre	245	0.13	0.34
stand-alone, local area	245	0.1	0.3
sub-regional shopping centre	245	0.44	0.5
regional shopping centre	245	0.16	0.37
other	245	0.17	0.36
share of children's products in total sales	245	0.29	0.11
Sales assistants characteristics			
average sales assistant's age, years, adjusted for full-time equivalence (FTE)	245	34.71	6.61
average sales assistant's tenure, years, FTE	245	7.26	3.71
share of male sales assistants, FTE	245	0.13	0.14
share of sales assistants working: 0–4 hrs per week	245	0.33	0.19
5–14 hrs per week	245	0.25	0.17
15–30 hrs per week	245	0.22	0.16
30+ hrs per week	245	0.2	0.1
sales assistant's average hourly pay	245	5.02	0.23
area average hourly pay for a similar job[a]	21	7.49	0.87
number of sales assistants working on an average week	12656	15.32	11.06
number of sales assistants ever worked during the year	245	22.47	17.04
separations rate, FTE	245	0.15	0.11
hiring rate, FTE	245	0.08	0.07
Area characteristics			
area average pay	21	11.05	1.54
area unemployment rate	21	0.05	0.01
number of competitors in a store's catchment area	245	36.45	25.89
Store manager characteristics			
manager age (years)	236	38.06	10.09
manager experience (years)	236	10.71	6.38
store manager is male	236	0.27	0.44
manager hourly pay (based on 1,900 hours worked per year), data for 2006	236	11.24	2.59
share of bonus payments in total pay	236	0.028	0.034
area average hourly pay for a similar job[b], data for January–September 2006	21	11.06	1.45

[a] Intermediate, routine and semi-routine sales and services
(categories 7.2, 12.1, 12.2 and 13.1 of the Labour Force Survey occupation classifier).
[b] Lower managerial (category 5.0) and lower and higher supervisory occupations (categories 6.0 and 10.0).

Table 3: Averages of key variables by KBI grade.

KBI	grade	%	FTE personnel	Store space	Manager pay	Competition, 1 to 4	Productivity
Sales focus	dvlp. need	17.14	6.49	119.57	10.48	2.24	55.45
	capable	59.18	7.97	142.93	10.95	2.41	59.47
	strength	23.68	11.61	185.37	12.55	2.82	61.60
Commercial awareness	dvlp. need	17.55	6.56	125.73	10.29	2.19	55.59
	capable	56.33	7.75	139.41	10.96	2.31	58.49
	strength	26.12	11.72	185.24	12.54	3.07	62.80
Leadership	dvlp. need	17.55	7.30	136.25	10.55	2.40	57.34
	capable	54.29	7.49	132.71	10.83	2.27	59.24
	strength	28.16	11.48	188.28	12.53	2.86	61.01
Developing people	dvlp. need	39.59	7.33	134.50	10.65	2.31	58.32
	capable	44.90	8.24	140.66	11.08	2.39	59.36
	strength	15.51	12.74	210.02	13.24	3.09	62.20
Drive and personal development	dvlp. need	21.22	6.87	125.04	10.61	2.29	57.20
	capable	49.80	8.00	140.58	11.10	2.35	59.43
	strength	28.98	10.83	180.95	11.95	2.80	61.04
Planning and organising	dvlp. need	4.49	7.13	135.22	11.02	2.36	60.56
	capable	42.04	6.97	124.62	10.54	2.18	57.53
	strength	53.47	9.97	169.29	11.80	2.71	60.86

Note: 1 – number of competitors 1-17 (bottom 25%), 4 – number of competitors more than 51 (top 25%).

Table 4: Main regression results (equation 11).

Dependent variable: Log Sales								
				Input Elasticities (N=12,671)				
labour, short-run								
labour X planning=“d.need”					0.176			
labour X planning=“capable”					0.271**			
labour X planning=“strength”					0.256**			
labour, long-run					0.436***			
store space					0.329***			
				Management Grades [a] (N=245)				
sales focus	“capable”	0.062***						0.001
	“strength”	0.123***						0.034
commercial awareness	“capable”		0.106***					0.106***
	“strength”		0.184***					0.172***
leadership	“capable”			0.082***				0.057**
	“strength”			0.092***				0.014
developing people	“capable”				0.018			-0.019
	“strength”				0.075***			-0.001
drive & pers. development	“capable”					0.032		0.004
	“strength”					0.084***		0.028
planning & organising	“capable”						-0.009	-0.051
	“strength”						0.036	-0.064
				Other Controls				
weekly contract hours [b]	0–4							0.283***
	5–14							0.189**
	15–29							0.194**
ln(area average pay)								0.953***
area unemployment rate								-2.788*
ln(store assistant relative pay)								0.692***
competitors in catchment area [c]	18-30							0.002
	31-51							0.147***
	52+							0.278***
error-correction term (1-γ)								0.579***
proxy for last year’s shock (ξ_{ip})								0.681***

Standard errors of regression: $\sigma_v = 0.128$ (within-store); $\sigma_\eta = 0.107$ (between-store).
[a] “development need” is the base category.
[b] share of of employees working 30+ hours per week is the base category.
[c] number of competitors fewer than 17 (first quartile of distribution) is the base category.
Other controls include: dummies for week and their interactions with changes in labour input, area manager dummies (20), location, brand, average employee age, tenure, turnover, share of male employees, share of children’s products in total.
From this Table onwards, ***, ** and * denote estimates significant at 1%, 5% and 10% respectively.

Table 5: Determinants of store manager pay (equation 9).

Dependent variable: log total salary in 2006	coeff.	std.dev.	
η (residual from the sales equation 11)	0.203	0.083	**
ln(area average pay for a similar job)	0.349	0.071	***
ln(FTE personnel)	0.288	0.023	***
store manager age	0.001	0.001	
experience with the company	0.002	0.001	
store manager is male	0.042	0.019	**
"strength" for developing people	0.051	0.031	*
other KBI grades	insignificant		
no. of competitors 18-30	0.014	0.023	
31-51	0.050	0.027	*
52+	0.003	0.033	
adjusted R^2	0.701		
Number of observations	234		

Note: Only managers still employed in 2006 as in 2005 are included, hence the smaller number of observations.

Table 6: Robustness checks for the sales equation 11.

	Specification	**I** noise controls		**II** resid. h'scedasticity		**III** extra mgmt variables		**IV**	
sales focus	"capable"	0.010		0.007		0.010		0.004	
	"strength"	0.040		0.035		0.029		0.019	
commercial	"capable"	0.112	***	0.096	***	0.095	***	0.091	***
awareness	"strength"	0.181	***	0.154	***	0.160	***	0.153	***
leadership	"capable"	0.049	**	0.042	*	0.034		0.034	
	"strength"	0.007		-0.004		-0.005		-0.009	
developing	"capable"	-0.020		-0.010		-0.031		-0.044	**
people	"strength"	-0.002		0.018		-0.005		-0.032	
drive &	"capable"	0.007		-0.016		0.006		0.002	
development	"strength"	0.032		0.034		0.024		0.017	
planning &	"capable"	-0.059	*	-0.044		-0.043		-0.059	
organising	"strength"	-0.069	*	-0.058		-0.058		-0.070	*
manager grade[a]	A (0.82% of sample)					0.207	**	0.204	**
	B (14.3%)					0.080	*	0.077	*
	C (65.3%)					0.067	*	0.065	*
	D (14.7%)					-0.004		-0.011	
all "development need" (0.82%)								-0.076	
all "capable" or higher (48.57%)								0.021	
all "strength" (6.53%)[b]								0.038	

[a] base category: grade E (the lowest).
[b] base category: at least one "development need".
All other controls remain.

Table 7: Robustness checks for the store manager pay equation 9.

			"commercial awareness" grades			test equal			test equal
		overall	"dev.need"	"capable"	"strength"	p-val.	$\eta < 0$	$\eta > 0$	p-val.
η		0.203**	0.199	0.244**	0.075	0.763	0.273	-0.135	0.094
ln(av. pay for similar job)		0.349***	0.351	0.294***	0.435**	0.692	0.361***	0.370***	0.949
ln(FTE personnel)		0.288***	0.307***	0.279***	0.291***	0.940	0.282***	0.278***	0.927
store manager age		0.001	0.000	-0.001	0.007**	0.001	0.003**	-0.001	0.038
experience		0.002	0.001	0.005**	-0.006	0.044	-0.001	0.006**	0.029
store manager is male		0.042**	0.018	0.076***	-0.019	0.140	0.066**	0.048*	0.637
sales focus	"capable"	-0.001	-0.044	0.017	-0.007	0.369	-0.039	0.032	0.075
	"strength"	0.010	-0.002	0.058	0.026	0.580	0.009	0.034	0.653
commercial	"capable"	0.015					-0.021	0.047*	0.079
awareness	"strength"	0.020					-0.022	0.070*	0.074
leadership	"capable"	-0.001	0.005	0.001	-0.171	0.141	-0.020	0.000	0.672
	"strength"	0.003	0.146	0.027	-0.194	0.059	-0.023	0.056	0.211
developing	"capable"	0.009	-0.042	0.005	0.177**	0.016	0.039	-0.026	0.097
people	"strength"	0.051*	n.a.	0.054	0.154**	0.053	0.116**	-0.046	0.014
drive &	"capable"	0.000	0.045	-0.024	-0.007	0.231	0.024	-0.026	0.200
development	"strength"	-0.035	n.a.	-0.062*	-0.001	0.157	-0.008	-0.067	0.298
planning &	"capable"	-0.023	-0.001	-0.059	0.071	0.065	-0.009	-0.046	0.491
organising	"strength"	-0.037	-0.008	-0.085	n.a.	0.002	-0.014	-0.077**	0.276
Number of observations		234	42	134	58		115	119	

All other controls remain.