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The Effect of Labor on Profitability: The Role of Quality

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Determining staffing levels is an important decision in retail operations. While the costs of increasing labor are obvious and easy to measure, the benefits are often indirect and not immediately felt. One benefit of increased labor is improved quality. The objective of this paper is to examine the effect of labor on profitability through its impact on quality. I examine both conformance quality and service quality. Using longitudinal data from stores of a large retailer, I find that increasing the amount of labor at a store is associated with an increase in profitability through its impact on conformance quality but not its impact on service quality. While increasing labor is associated with an increase in service quality, in this setting there is no significant relationship between service quality and profitability. My findings highlight the importance of attending to process discipline in certain service settings. They also show that too much corporate emphasis on payroll management may motivate managers to operate with insufficient labor levels, which, in turn, degrades profitability.

Keywords: Labor Capacity Management, Quality, Retail Operations

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1. Introduction

Determining staffing levels is an important decision in retail operations. Store labor is a large expense; in 2006, retailers spent $393 billion on employee wages,[1] more than 10% of their revenue that year.[2] But staffing levels also affect conformance quality (CQ)—how well employees execute prescribed

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[1] Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages for NAICS codes 44-45 (Retail Trade). Note that the $392.97 billion also includes wages of corporate employees.

[2] Labor expenses are high compared to other operating expenses. For example, in 2006, average retail inventory was $483.7 billion. Assuming a 25% holding cost, inventory holding costs were only about 30% of employee wages in that same year.

processes—and service quality (SQ)—the extent to which customers have a positive service experience at the stores (Lovejoy and Sethuraman 2000; Oliva and Sterman 2001). While there is overwhelming evidence that CQ and SQ improve sales, both generally (e.g., Sousa and Voss 2002; Gupta and Zeithaml 2006) and in retail settings (Fisher et al. 2006; Ton and Raman 2008), there is limited evidence indicating their effect on profitability. This paper examines how a store's staffing level affects profitability through its impact on CQ and SQ.

The motivation for this study came from a recent study by Fisher et al. (2006), who show that more labor at a store is associated with substantially higher sales, as well as from my conversations with retail executives who claim that they often have insufficient store labor because they see it more as a cost than as a profit-driver. Indeed, some scholars suggest that when the costs of increasing labor are obvious and easy to measure and the benefits are indirect and not immediately felt, managers may pay too much heed to the costs and staff their stores at sub-optimal levels (King and Lenox 2002).

To examine the links between labor levels, CQ and SQ, and profitability, I use extensive data from stores of a large retailer. My research design takes advantage of the fact that I am able to observe stores that are owned and operated by the same company over time. Hence, I can control for other factors that may affect CQ, SQ, and profitability, including the physical design of the store (Sulek et al. 1995), use of technology (Mithas et al. 2005), and employee incentives (Banker et al. 1996).

I find that increasing the amount of labor in a store is associated with higher profitability through its positive impact on CQ. But while I also find that increasing the amount of labor has a positive impact on SQ, I find no significant relationship between SQ and profit margins. These findings have both operational and strategic implications. Operationally, given that increasing the amount of labor is associated with higher profitability, the stores I study are, on average, operating at a level where the marginal benefit of adding labor exceeds the marginal cost. Strategically, my findings suggest that, in certain service settings, CQ can have more impact on profitability than SQ does. This is important because many companies, including my research site, often emphasize SQ over CQ.

My study draws from and contributes to the literature on quality's effect on profitability. Most research in service settings focuses on SQ. Although some authors argue for the benefits of bringing process discipline to service settings (Levitt 1972), there is limited evidence for the positive effect of CQ on profitability in such settings (Tsikritsis 2007). My study provides further empirical evidence of precisely that effect. Studies that examine the effect of SQ on profitability offer mixed results, possibly due to the cross-sectional nature of these studies (Zeithaml 2000). Findings from my longitudinal study support those studies that do not find a significant effect of SQ on profitability (Ittner and Larcker 1998).

CQ and SQ are generally seen as measures of operational performance and marketing performance, respectively. While several authors argue for the benefits of examining operational and marketing performance measures simultaneously (e.g., Roth and Van der Velde 1991) to assess their relative importance, there is only limited empirical work on this topic. Rust et al. (2002) show that companies that emphasize revenue expansion—a measure of marketing performance—financially outperform companies that emphasize cost reduction—a measure of operational performance, financial performance being measured as managers' perceptions of their firm's financial performance. My findings contradict those of Rust el al. (2002) and suggest that the relative importance of marketing versus operational performance would depend on the context.

Finally, this study addresses an important gap in the retail operations literature—the management of store labor capacity. Fisher et al. (2006) examine the impact of labor levels on customer satisfaction and sales. I, in turn, examine the impact of labor levels on profitability and identify CQ as an additional mechanism through which labor level affects a store's financial performance.

Section 2 reviews the related literature and states the hypothesis of the study. Section 3 describes the empirical setting, data, and methods. Section 4 presents and discusses results. Section 5 concludes.

2. Related Literature and Hypothesis of the Study

2.1 The Effect of Labor Levels on Quality

Increasing the amount of labor in operating contexts has been associated with increasing both SQ and CQ. As argued by Hopp et al. (2007), increasing the amount of labor allows employees to spend more

time with customers. Fisher et al. (2006) show that more labor at retail stores is associated with higher customer satisfaction and higher sales. Oliva and Sterman (2001) show that increasing the amount of labor, and thus reducing the workload per employee, also reduces the likelihood that employees would make errors or cut corners in performing their tasks. Roth and Jackson (1995) also say that becoming lean, in terms of decreasing labor levels, has the hidden cost of reduced SQ. In a non-service context, Lovejoy and Sethuraman (2000) state that increasing employee workload can result in errors leading to quality problems. All these studies point to a positive relationship between labor levels and quality.

2.2 The Effect of Quality on Profitability

Quality has been used and defined in several ways (Garvin 1987). Critiquing this variety of approaches is beyond the scope of this paper. In my research setting, two dimensions of quality are particularly important: SQ and CQ. Consistent with prior literature, SQ in my setting is defined externally by the customer; it measures customers' assessment of their service experience (Parasuraman et al. 1985). Also consistent with prior literature, CQ in my setting is an internal measure of quality[3] and is defined as the degree to which stores conform to prescribed standards related to logistics activities (Garvin 1988).[4] Below, I review the literature that examines the effects of SQ and CQ on firm profitability. I exclude those studies that examine the effect of Total Quality Management (TQM) practices on firm performance because TQM is not a specific measure of quality, but a broad management practice.

The effect of service quality on profitability

The relationship between SQ and profitability is best described by three of the linkages in the service profit chain (Heskett et al. 1994). Profitability is stimulated by loyal customers; customer loyalty results

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[3] Note, however, that that the term *internal quality* used in operations management literature is different from the term *internal quality* used in the service management literature to refer to employees' satisfaction with their work environment (Hallowell et al. 1996; Heskett et al. 1997).

[4] Note that CQ and SQ are not mutually exclusive. Conformance with prescribed processes is one driver of SQ (Parasuraman et al. 1985).

from customer satisfaction; customer satisfaction results from the value of services provided to the customers. The value of services provided to the customers is a function of SQ. Empirical evidence for some of the linkages in the service profit chain, however, has been limited (Kamakura et al. 2002). While the positive relationship between SQ, customer satisfaction, customer loyalty, and increased sales is empirically well established (e.g., Ittner and Larcker 1998; Loveman 1998), the relationship between SQ, customer satisfaction, and profitability is not. (See Zeithaml 2000 and Gupta and Zeithaml 2006 for reviews of studies that examine the effect of SQ and customer satisfaction on firm financial performance.)

Studies at the firm and industry levels offer mixed results about the effect of SQ on profitability. For example, in a study of 140 firms in the United States, Ittner and Larcker (1998) find a positive relationship between customer satisfaction and market value of equity in a firm. In a study of 200 firms in the U.S., Anderson et al. (2004) also find a positive relationship between customer satisfaction and market value of a firm, measured as Tobin's q. However, the industry-level findings differ between these two studies. Anderson et al. (2004) find the strongest link between customer satisfaction and Tobin's q at department stores; yet Ittner and Larcker (1998) find a negative relationship between customer satisfaction and market value of equity in the retail industry. In a study of Swedish firms, Anderson et al. (1997) find that the relationship between customer satisfaction and return on investment varies across industries. For example, in some industries, such as department stores, gas stations, and supermarkets, firms that have low customer satisfaction also have the highest return on investment. The authors also find that higher customer satisfaction is associated with higher labor productivity for firms producing goods but with lower labor productivity for service firms, indicating a trade-off between customer satisfaction and productivity in service settings. Using data from 77 firms, Mittal et al. (2005) find limited evidence for the effect of customer satisfaction on stock returns. But the authors find a positive effect of customer satisfaction on Tobin's q, an effect that is more pronounced for more efficient firms.

Studies at the business-unit level offer limited evidence about the effect of SQ on profitability. Using data from patients discharged from 51 hospitals, Nelson et al. (1992) find that SQ is associated with hospital revenue, earnings, and return on assets. Using data from 73 branches of a bank, Ittner and

Larcker (1998) find that, while customer satisfaction is associated with increased sales, it has no effect on measures of profitability. Using data from stores of a grocery chain, Sulek et al. (1995) find that customer satisfaction is associated with higher sales per labor hour—a measure of labor productivity—a result which contradicts that of Anderson et al. (1997).

The mixed evidence about the effect of SQ on profitability suggests that the effect depends on the operating context. Hence, as recommended by Zeithaml (2000), the relationship between SQ and profitability needs to be studied in specific contexts so that theoretical relationships for categories of companies can be generalized.

The effect of conformance quality on profitability

Many argue that investment in CQ is associated with long-term firm performance because it allows firms to learn and improve more quickly (Crosby 1980; Fine 1986; Li and Rajagopalan 1998). Several empirical studies show a positive effect of CQ on operational performance (e.g., Maani et al. 1994; White 1996; Krishnan et al. 2000) and customer satisfaction (Fynes and Voss 2001; Tsikritsis and Heineke 2004). Ton and Huckman (2008) show that CQ moderates the effect of employee turnover on firm performance.

But there is limited empirical evidence for the positive effect of CQ on financial performance (Sousa and Voss 2002). Using longitudinal data from 10 major airlines, Tsikritsis (2007) finds no relationship between CQ, measured as lost baggage, and return on sales but does find a negative relationship between late arrivals, another measure of internal quality, and return on sales. Using data from 200 manufacturing companies in the electronics sector in Ireland, Fynes and Voss (2001) find no relationship between CQ and overall business performance. But Corbett et al. (2005) examine ISO 9000 certification, a well-defined and focused method of standardization and process conformance, and find that firms that decide to seek their first ISO 9000 certification perform better than control firms with similar characteristics on several measures of financial performance, including return on sales and Tobin's q.

Several studies also look at the effect of process performance on firm profitability. Using data from bank holding companies in the U.S., Frei et al. (1999) show that banks with better process performance

also have higher return on assets. Using data from 249 firms in the automotive and computer industries, Ittner and Larcker (1997) find evidence that greater use of process-focused improvement methods is positively related to return on assets, but not to return on sales. There are also studies that link operational efficiency and SQ to profitability. Cyprus, Soteriou, and Zenios (1999) examine these relationships and find that operational efficiency and SQ are correlated, but the authors do not report a significantly positive relationship between SQ and profitability. Kamakura et al. (2002) also identify units that can offer SQ and profits more efficiently.

The dearth of empirical evidence linking CQ and profitability provides an opportunity to examine this relationship further.

2.3 The Effect of Labor on Profitability through Quality

The literature review suggests a positive relationship between labor levels and quality, but also suggests that the relationship between quality and profitability will depend on the context. At retail stores, increasing the labor level is likely to increase both CQ and SQ. When store employees have more time, they are less likely to make errors in activities such as shelving merchandise or placing price tags on display shelves and more likely to spend time with customers. In turn, sales are likely to be higher when products are shelved properly (Ton and Raman 2008) and salespeople are available (Fisher et al. 2006). CQ is also expected to increase future sales at retail chains that use centralized merchandise planning systems, since the performance of these system depends on conformance to in-store merchandising specifications and on accurate point-of-sale and inventory data (Raman et al. 2001).

In addition to increasing sales, CQ is likely to improve labor productivity and reduce shrink. Employees can shelve, replenish, and help customers find products more quickly and fewer products are expected to be damaged or lost. Given these arguments, I hypothesize:

HYPOTHESIS 1: *Service and conformance quality mediate the effect of labor on profitability at retail stores. That is, increasing the amount of labor is associated with an increase in service and conformance quality which, in turn, is associated with an increase in profitability.*

3. Research Design

3.1 Data and Measures

I test my hypothesis using data from Beta Corporation,[5] a large specialty retailer. Beta carries undifferentiated products; customers can easily find a particular product at another retailer if Beta does not have it. To ensure product availability, the retailer has invested heavily in information technology. Its centralized merchandise planning system is designed to send the right product to the right store at the right time. In-store technologies help customers locate products without help from employees. Decisions related to store organization and product presentation are centralized at Beta.

I interviewed several Beta executives, including the CEO, the president of store operations, and the vice president of planning. I also interviewed district managers, store managers, and store employees. I spent considerable time observing store employees at work, including time spent at information desks watching employees help customers. This fieldwork was critical in understanding how store managers made labor planning decisions and how store employees as well as corporate managers perceived the importance of various store activities. I complemented my fieldwork with substantial quantitative data.

I use data from all 268 Beta stores that opened before August 1999. I obtained monthly data on labor, SQ, and profitability from 1999 to 2002, but only yearly data for two out of the three measures of CQ. Hence, my analysis focuses on yearly data. Below, I describe each of the variables used in my study.

Profitability: I use profit margin, defined as the operating income divided by sales, as a measure of profitability. My measure is consistent with other studies that use return on sales as a measure of profitability. To examine whether CQ and SQ affect profit margins by affecting sales or costs, I also consider models using sales and costs as dependent variables. While I expect both CQ and SQ to have a positive effect on sales, I expect CQ to have a larger effect because Beta competes on product availability, not personalized service (customers shop on their own), and uses a centralized merchandise planning system. I also expect CQ to decrease costs by improving labor productivity and reducing shrink. I observed that employees at Beta stores wasted considerable time searching for products or double-

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[5] The name of the retailer is disguised for confidentiality.

checking the system. During two of my store visits, I spent several hours at the information desk. When an employee took a call from a customer asking for a particular product and the computer system indicated it was in stock, the employee would still check the shelf to make sure—often a time-consuming step. When CQ is high, employees are more likely to trust that the products will be where they belong, making a physical check unnecessary. SQ is also likely to be higher when CQ is high because customers should not have to wait as long for products to be found.

Labor: The amount of labor is measured as total labor dollars spent at a store in a given year. It includes wages and benefits. This is determined in part by Beta headquarters and in part by store managers. Headquarters designs the organizational structure and the roles of each employee type and sends each store a payroll plan for each month, based on that store's historical labor spending, prior sales, and the expected sales and labor needs for a given period. While store managers use the plan as a guide, they ultimately determine the payroll dollars that they will spend in a given period. I use payroll dollars as opposed to the number of people working at the store because 46% of the employees at Beta stores are part-time employees with varying work hours and I do not have access to full-time equivalency for them. Nor do I have access to total number of hours worked at the stores.

Service Quality: To measure customers' assessment of their service experience, Beta works with a third-party company which sends a mystery shopper to each store once a month. During their visits, mystery shoppers fill out a form consisting of approximately 50 questions and with two main sections (service environment and service interactions). The questions reflect the five dimensions of SQ. Questions on *tangibles* include whether the facilities in restrooms were in working order and whether different areas in the store were clean and neat. Questions on *responsiveness* and *assurance* include whether employees at the information desk asked relevant questions and provided the customer with other options if the product he or she was looking for was not in stock (e.g., check other locations or special order). Questions on *reliability* include whether customers could find the products that were shown to be available on in-store computer terminals, the amount of time elapsed between approaching the information desk and being served, and the amount of time spent at the cash register. Questions on *empathy* include whether

employees verbally acknowledged or greeted the customer and whether employees at the information desk made eye contact. The overall score is based on the mystery shopper's answers to these questions.

Conformance Quality: The retailer tracks three metrics related to conformance to the centralized decisions on merchandise planning and display.

Phantom products tracks whether stores present on their display shelves the full assortment of products sent to them. Like most other retailers, Beta stores receive more units of a product than they can display; they keep extra units in storage areas. Employees are supposed to replenish from storage when the units on the selling floor are sold. When employees fail to replenish, stores are left with products that are in storage areas but not on the selling floor. Customers experience stockouts unless they ask for help and the employees take the time to find the products in storage. In addition, phantom products distort the information used by the centralized merchandise planning systems. When a product that is in storage but not on the selling floor cannot be found by customers who wish to purchase it, the planning system will wrongly conclude that there is no demand for the product. *Phantom products* tracks the percentage of products that are in storage areas but not on the selling floor at the time of the physical audit.[6]

Returns conformance tracks whether stores return the products they are supposed to return to the distribution centers. At the beginning of each month, each store receives a returns list from Beta's corporate office and is expected to return all products on the list to Beta distribution centers by the end of the month. At the end of each returns period, stores receive a *returns conformance* score based on the number of units returned divided by the number that were supposed to be returned. Because Beta stores

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[6] Physical audits are conducted once a year. Stores are closed during physical audits. Labor's effect on phantom products or phantom products' effect on profit margins would be most pertinent during the month preceding the physical audit (Ton and Raman 2008). In models where I use phantom products either as a dependent or an independent variable, I compare results using yearly data with those using only data from the month preceding the audit; they are very similar.

tend to have more products than they can display on the selling floor, failure to return slow-moving products that are on display shelves results in less display space available for new products.

Store conditions tracks whether stores conform to a wide range of standards related to the flow and storage of products. The store-conditions report is generated quarterly from regional directors' store visits. Its four categories—three for major product groups and one for store operations—are divided into sections. For example, one product category is divided into sections including shelf organization, endcaps, and product flow. Each section is further divided into items. For example, shelf organization is divided into items including fullness and shelf labels. The section score is the average of the item scores. Section scores are weighted and summed to create the total store-conditions score. For this measure, I was able to obtain only three years of data for the stores that opened before August 1999.

For returns conformance and phantom products, nonconformance results from employees making mistakes or cutting corners; employees have no reason to deliberately leave products in storage areas or not return products to distribution centers. But for store conditions, I observed some deliberate nonconformance. For example, employees at one store organized shelves in violation of shelving standards because they believed customers would be much more likely to find what they were looking for. Hence, for *store conditions*, the effect of labor on CQ may be weaker and, to the extent that employees may be making the right choice by violating shelving standards, the effect of store conditions on profit margins may be weaker.

Table 2a presents correlations among average conformance-quality measures for each store. It shows that stores that conform well to one measure typically conform well to the others. **Table 2b** presents correlations among CQ levels within stores, calculated by subtracting each year's CQ score from the average CQ score for that store. It shows that higher conformance to one measure *within* a store is associated with higher conformance to other measures. To create a composite measure of CQ, I standardize each measure of CQ for each year by subtracting the mean and dividing by the standard deviation. I then average these standardized scores, adding returns-conformance and store-conditions

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scores (measures of conformance) and subtracting phantom-products scores (a measure of nonconformance).

3.2 Empirical Model

To test whether CQ and SQ mediate the effect of labor levels on profit margins, four equations need to be estimated (Barron and Kenny 1986).[7] Two regress the mediators (CQ and SQ) on the independent variable (labor), one regresses the dependent variable (profit margin) on the independent variable, and one regresses the dependent variable on both the independent variable and the mediators.

$$\text{Conformance Quality}_{it} = \alpha_i + \lambda_t + \beta_1 \text{ Labor}_{it} + X_{it}\beta + \varepsilon_{it} \qquad (1)$$

$$\text{Service Quality}_{it} = \omega_i + \kappa_t + \rho_1 \text{ Labor}_{it} + X_{it}\rho + \varepsilon_{it} \qquad (2)$$

$$\text{Profit Margin}_{it} = \delta_i + \phi_t + \sigma_1 \text{ Labor}_{it} + X_{it}\sigma + \varepsilon_{it} \qquad (3)$$

$$\text{Profit Margin}_{it} = \eta_i + \theta_t + \gamma_1 \text{Conformance Quality}_{it} + \gamma_2 \text{ Service Quality}_{it} + \qquad (4)$$
$$\gamma_3 \text{ Labor}_{it} + X_{it}\gamma + \varepsilon_{it}$$

In these equations, α_i, ω_i, δ_i, and η_i represent fixed effects for each store and λ_t, κ_t, φ_t, and θ_t represent fixed effects for each year. Store fixed effects control for time-invariant unobserved heterogeneity across stores, which might otherwise affect store labor, CQ, SQ, and profitability. The year effects control for factors, such as economic conditions and corporate policies, which, if they change over time, will change for all stores. All equations include the vector X_{it}, which contains ten store-level time-varying variables.

One element of X_{it} is *planning mismatch*, which measures the degree of mismatch between a store's payroll plans and its actual workload. CQ, SQ, and profitability are expected to be better when corporate provides a payroll plan that better matches the actual workload at the store. X_{it} also includes *execution mismatch*, which measures the degree of mismatch between payroll plans and actual labor spending. Deviation from payroll plans is used as a proxy for store managers' ability to manage labor spending.

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[7] Note that Barron and Kenny's model of mediation has been used in a wide range of literatures ranging from organizational behavior (e.g., Naveh et al. 2005; Ren et al. 2006) to marketing (e.g., Soman and Shi 2003) to operations management (e.g., Elliot et al. 2007).

Store performance is expected to be better when execution mismatch is lower. I follow Fisher et al.'s (2007) methodology to create planning and execution mismatch variables and use monthly sales as a proxy for a store's workload. I first create 12 monthly seasonality factors for sales, payroll plans, and actual payroll dollars spent for each store for each year. I calculate the planning mismatch by subtracting the correlation between the seasonality factor for payroll plans and the seasonality factor for sales from 1. Similarly, I calculate execution mismatch by subtracting from 1 the correlation between the seasonality factor for payroll plans and the seasonality factor for actual payroll dollars spent.

Vector X_{it} also includes full-time employees as a percentage of total employees to control for employee mix, employee turnover to control for tacit knowledge lost when employees leave, store manager turnover to control for management changes, units of inventory at the store to control for the level of complexity in the operating environment, unemployment rate in the store's metropolitan statistical area[8] to control for differences in labor market conditions, and the number of competitors in the local market to control for competition.

Store labor may be endogenous to quality or profitability. Stores with higher CQ, SQ, or profitability may have better managers who use high labor levels. These stores may also receive more resources from headquarters to spend on labor. My model with store fixed effects controls for differences across stores. I include store manager turnover to control for any changes that would result from new management. But *within* a store over time, store managers may increase labor levels in expectation of high profit margins or high sales.[9] To control for such effects, vector X_{it} includes planned profit margins and planned sales during the year, which are calculated by headquarters for each store based on economic and industry

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[8] Source: Bureau of Labor Statistics.

[9] Changes in CQ may also affect labor levels. An increase in CQ would improve labor productivity, allowing a store to manage tasks with fewer resources. Hence, to the extent that I observe a positive relationship between labor levels and CQ, the results would be conservative.

trends, investor expectations, historical financial performance at each store, and expected changes in the store environment (e.g., the opening of a competitor store or construction within or around the store).

The relationships between store labor and CQ, SQ, and profitability are expected to be nonlinear. When the labor level is very low, certain tasks may go undone so CQ and SQ may suffer. As the labor level increases, however, the marginal benefit of an additional dollar spent on labor is likely to decrease; increasing labor is unlikely to have significant impact on CQ or SQ when store employees already have plenty of time to perform logistics or customer service tasks. The marginal cost of labor, on the other hand, remains the same at all labor levels. To test for nonlinearity between store labor and CQ and SQ, I estimate models where I use the log of store labor in equations (1) and (2). I also estimate models in which I include a squared term for labor and models in which store labor interacts with three categories of labor—high, medium, and low—which I created by ranking and then dividing stores into thirds based on their labor spending in a year. To test for nonlinearity between store labor and profitability, I estimate models where I include a squared term for labor in equation (3). I also estimate a model in which store labor interacts with the three categories of labor. To test for nonlinearity between CQ and profitability and between SQ and profitability, I estimate equation (4) using log of CQ and log of SQ as well as including interactions between CQ and SQ with three categories of CQ and SQ.

3.3 Model Estimation and Alternate Models

I estimate the parameters of equations (1) and (2) using ordinary least squares (OLS) estimators with heteroskedasticity-robust standard errors for OLS as recommended by Huber (1967) and White (1980). Profitability in year t is expected to be correlated with profitability in year t-1. Hence, in equations (3) and (4), I consider a flexible structure of the variance-covariance matrix of the errors with first-order autocorrelations and estimate the parameters using Beach and MacKinnon's (1978) algorithm with maximum likelihood (ML) estimation. To examine whether CQ and SQ affects profit margins through their effect on sales or costs, I also estimate equation (4) using sales and cost as dependent variables.

I estimate the parameters of equation (5) below to examine potential lagged effects of labor and CQ and SQ on profit margins after controlling for lagged profit margins. Because my panel has a short time-

series dimension, I estimate the parameters using the generalized method-of-moments (GMM) dynamic panel model developed by Arrelano and Bond (1991)[10].

$$\text{Profit Margin}_{it} = \alpha_i + \lambda_t + \beta \text{ Profit Margin}_{i,t-1} + \sum_{l=0}^{1} \psi_l \text{Conformance Quality}_{i,t-l} +$$

$$\sum_{l=0}^{1} \nu_l \text{Service Quality}_{i,t-l} + \sum_{l=0}^{1} \delta_l \text{ } Labor_{i,t-l} + X_{it}\gamma + \varepsilon_{it} \qquad (5)$$

As a further robustness test, I estimate two other models. I use first differencing to examine the effect of changes in labor, CQ, and SQ from year t-1 to year t on change in profit margins from year t-1 to year t. I also use deviation from planned profit margins (actual profit margin–plan profit margin) as a dependent variable and examine the effect of deviation from payroll plans (actual payroll–plan payroll) and CQ and SQ on deviation from planned profit margins.

4. Results and Discussion

The effect of labor on conformance quality and service quality

Columns 1 and 2 of **Table 3** present results for testing the effect of store labor on CQ and SQ, respectively. Increasing labor at a store is associated with higher CQ and SQ. It is also associated with better overall conformance to each of the individual measures of CQ (**Table 4**). There is no evidence of a nonlinear effect of store labor on conformance or SQ. Quadratic term for store labor and interactions of store labor with different levels of labor (unreported) are not statistically significant when using CQ or SQ as dependent variables. Although the log of store labor is significant, there is no improvement in the fit of the model. These results suggest that the level of labor at Beta stores is low enough that adding more labor would still improve CQ, SQ, or both.

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[10]The Arrelano and Bond estimator first differences the equation and uses all available lags of the independent variables dated t-2 periods and earlier as instruments for changes in the lagged values of profit margins. Hence, at least four time periods are required to use this estimator. The store-conditions measure was available for only three years, so in order to use the Arrelano and Bond estimator, I created a composite measure of conformance quality without store conditions and used all four years of data.

In terms of magnitude, increasing store labor has a stronger effect on CQ than on SQ. A one-standard-deviation increase in store labor is associated with a 0.61-standard-deviation increase in CQ but only a 0.17-standard-deviation increase in SQ. One explanation for this result is that store managers pay more attention to customer-service-related activities than to logistics-related activities. When I asked store managers to identify the top three indicators of store performance, almost all mentioned customer service, but none mentioned conformance to logistics-related activities. When referring to returns conformance, one store manager told me: *"It's one of the first things that will get dropped when you've got too much going on or when things are too challenging, you don't have enough staff or whatever. I think it's one of the first things that will get dropped because we don't mentally see it as driving sales even though we know that if we return those inventory we'll get newer fresher inventory."*

The lack of emphasis on CQ is not surprising, as Beta's own internal measures emphasize customer-service-related activities over logistics-related activities. At the time of my study, the SQ measure had a 20% weight in store manager evaluations while CQ measures such as store conditions and returns conformance had weights of only 10% and less than 1%, respectively. Another CQ measure, phantom products, had no weight at all. As a result, store managers are more likely to invest their resources (including labor) in customer-service-related tasks than in logistics-related tasks. This is consistent with Holmstrom and Milgrom (1991), who show that for agents who perform multiple tasks and are responsible for multiple performance measures, increasing compensation for any one activity will reallocate effort away from other activities.

In addition to labor, several control variables have statistically significant effects on CQ and SQ. As expected, both increasing employee turnover and the departure of store managers are associated with a decrease in CQ and SQ. Higher planning mismatch and increased complexity in the operating environment (measured as total units of inventory) are both associated with lower CQ but have no effect on SQ. Deviation from planned payroll spending (execution mismatch), the number of competitors in the area, and unemployment rate all have insignificant effects on CQ and SQ. Increasing the proportion of full-time employees has no effect on CQ but, surprisingly, a negative effect on SQ. This result can be

explained by the fact that many of the part-time employees I met worked at Beta because they loved the

products and were interested in talking about them. One employee told me that he works at Beta in

addition to his "real job" because he loves the products and the atmosphere. I met several retired

professionals who were working at Beta part-time for the same reason. Part-time employees also took

advantage of the employee discounts. These part-time employees may offer better customer service than

full-time employees who work at Beta to make a living.[11]

The effect of labor, conformance and service quality on profitability

Column 4 of **Table 3** reports results of the effect of labor on profit margin when using ML estimators

with auto-correlated errors. Similar results were obtained with OLS estimators. The coefficient of labor

is positive and significant. All else being constant, a one-standard-deviation increase in labor ($224,515,

shown in **Table 1**) is associated with a 0.9 percentage-point increase in profit margin, a 10% increase.

The robustness tests reported in **Table 5** show similar results. Column 1 shows the results when

performing the analysis in first differences; change in labor from year t to year t-1 has a positive and

statistically significant effect on change in profit margin. Column 3 shows the results when using

deviation from planned profit margins as a dependent variable; the coefficient of deviation from labor is

positive but not statistically significant (p=0.17). Column 5 shows the results when using dynamic panel

models. Both labor and lagged value of labor have positive coefficients, but only labor in the same period

is statistically significant (the p-value for lagged labor is 0.20).

I found no evidence of a nonlinear effect of store labor on profitability; the quadratic term for store

labor is insignificant. The interactions with the three levels of store labor are also insignificant. These

unreported results once again suggest that Beta stores generally operate with low enough labor levels that

the cost of additional labor would not outweigh its benefit. One potential reason for operating with such

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[11] Another explanation is that increasing the proportion of full-time employees reduces flexibility, making

it harder to match labor supply with a variable workload. But if that were the case, I would have observed

a similar effect of increasing the proportion of full-time employees on CQ.

low levels of labor could be that labor is unavailable, but store managers did not indicate to me that availability was a problem. I also examine the correlation between the unemployment level in a store's area and the store's payroll execution mismatch. If labor availability were related to the labor level, we would expect stores in areas with low unemployment rates to have more payroll execution mismatch. But the correlation is statistically insignificant.

Column 5 of **Table 3** presents results for testing the effect of CQ and SQ on profit margin using ML estimators with auto-correlated errors. Similar results are obtained with OLS estimators. CQ is positive and significant at the 1% level. A one-standard-deviation increase in CQ is associated with a 6.8% increase in profit margins. As shown in **Table 4,** individual measures of CQ also have significant effects on profit margin. SQ, on the other hand, has no statistically significant effect on profit margins. It also is not significant when CQ is not included as an independent variable, which is not reported here. I found no evidence of a nonlinear effect of conformance or SQ on profit margins.

Higher CQ is also associated with higher SQ. The correlations between returns conformance and SQ and between phantom products and SQ are both statistically significant (ρ=0.05, p=0.08 and ρ= -.08, p=.008, respectively). The composite measure of CQ has a positive and significant effect on SQ (**Table 3**, Column 3). I am unable to examine how CQ affects dimensions of SQ because I do not have data on dimensions of SQ. But given that CQ measures conformance to logistics-related activities, it is likely to increase SQ by improving the *reliability* and *tangibles* dimensions of SQ. When products are in their assigned locations and the shelves are appropriately labeled, customers are more likely to find what they want and to notice that the store is neat. Employees are also more likely to assist customers more quickly.

Columns 6 and 7 of **Table 3** show the effects of CQ and SQ on sales and costs, respectively. The cost measure is not ideal because it does not allow me to distinguish between cost of goods sold, rent, and other operating costs. Because higher sales inevitably leads to higher cost of goods sold, actual sales is included as a control variable when using cost as a dependent variable. When using sales as a dependent

variable, the coefficient of CQ is positive and significant while that of SQ is positive but not significant.[12]

When using cost as a dependent variable, the coefficient of CQ is negative and significant while that of

SQ is positive and significant. Hence, as predicted, good execution of logistics-related-activities not only

increases sales but also reduces costs. While customer-service-related activities may lead to an increase

in sales, as emphasized in the SQ literature, they also increase costs. The strong effect of CQ on sales

suggests that, at Beta stores, CQ is a stronger driver of customer satisfaction than SQ is.

   The robustness tests reported in **Table 5** show similar results.[13] Column 2 shows that a change in CQ

from year t-1 to year t is positively associated with a change in profit margins from year t-1 to year t.

Column 4 shows that CQ is associated with an increase in deviation from planned profit margins.

Column 6 shows that CQ is a significant driver of profit margins after controlling for lagged profit

margins. Moreover, there is a positive and significant lagged effect of CQ on profit margins. This

longer-term effect may be due to (a) future increases in sales as a result of increased customer satisfaction

or (b) future reductions in costs as a result of having orderly stores in which products are in their assigned

locations and the shelves are appropriately labeled.

   To test the indirect effect of labor on profitability through its impact on CQ, I use Sobel's (1982)

formula and calculate the standard errors associated with $\beta\gamma$, where β is the effect of labor on CQ and γ is

the effect of CQ on profitability (H_o: $\beta\gamma=0$):

$$\sigma_{\beta\gamma} = \sqrt{\beta^2\sigma_\gamma^2 + \gamma^2\sigma_\beta^2}$$

The indirect effect of store labor on profit margin, through its impact on CQ of .0017 = (.167*.010), is

significant at the 2% level and is also significant when using individual measures of CQ as mediators.

   For consistency, I included the same set of control variables in all models in which I used financial

performance as a dependent variable. These variables generally have the expected effects. More

[12] The coefficient of SQ is significant when CQ is not included as an independent variable. Using sales

per square foot as a dependent variable provides similar results.

[13] In **Table 5**, in order to use all four years of data, I excluded store conditions from my CQ measure.

competitors in the area is associated with lower profit margin and with lower sales. In **Table 5,** employee turnover is statistically significant only when CQ and SQ are not included in the models, suggesting that CQ and SQ mediate the effect of employee turnover on profit margins. Store manager turnover is significant in Column 4 of **Table 3** as well as Columns 3 and 4 of **Table 5**. Surprisingly, planning mismatch has a positive effect on profit margin. Further analysis shows that high planning mismatch occurs during years when sales are lower. During those years, planned sales are even lower than actual sales. When planned sales are low, store managers are likely to pay more attention to controlling other store-related expenses (e.g., cleaning, travel, food supplies[14]), resulting in higher profit margin.

An increase in unemployment rate is associated with a decrease in profit margins in all models, suggesting a decrease in consumption and hence in sales. Indeed, an increase in unemployment rate is associated with a decrease in sales but also with an increase in costs. The latter effect is surprising since wage rate is expected to decrease when unemployment is high. One explanation for the increase in costs may be a shift in product mix towards lower-margin items during poor economic conditions.

5. Conclusion

Matching staffing levels to the amount of workload is a challenge in service contexts that face highly variable customer demand. In this paper, I study just such a retail setting and find evidence for understaffing. I find that increasing the amount of labor at Beta stores is associated with an increase in profit margins. I also find that this effect is mediated by CQ. Although increasing the amount of labor is associated with both higher CQ and higher SQ, SQ has no effect on Beta's profit margins. Higher CQ, on the other hand, is associated with higher profit margins not only in a given year, but also in the subsequent year. Higher CQ is also associated with higher SQ, higher sales, and lower costs. I find no evidence for a nonlinear effect of labor on CQ, SQ, or profit margins, nor for a nonlinear effect of either SQ or CQ on profit margins.

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[14] Beta stores include small cafés and store managers are responsible for managing café supplies.

Although focusing on a single firm may limit the generalizability of my results, it allows me to gain a deep understanding of the context and to control for unobservable firm-level factors that may be correlated with staffing levels, CQ, SQ, and profitability. In addition, my findings may be applied to other forms of retailing as well as to other settings—such as hospitals and restaurants—where matching staffing levels to the amount of workload is difficult and where employees perform both production-related activities (such as in-store logistics) and customer-service-related activities.

My field observations at Beta stores as well as my conversations with executives of other retailers point to two related reasons for a tendency to understaff retail stores: an emphasis on minimizing payroll expenses and an emphasis on meeting short-term (often monthly) performance targets. Nonretail contexts with these characteristics may also suffer from understaffing. In different contexts, there may also be other reasons for understaffing (e.g., unavailability of nurses in hospitals).

An emphasis on minimizing payroll expenses encourages store managers to err on the side of having too little labor rather than too much labor when they set weekly or monthly staffing levels. This is because the negative effect of having too little labor is often difficult to quantify and may not be felt in the short run, while the negative effect of having too much labor makes itself felt immediately in lower profit margins. I would also point out that emphasis on payroll management can degrade employee morale. Beta store managers often reduce labor spending by changing employee schedules and reducing employees' hours, a common approach at other retail chains. Several employees at Beta and at other retailers told me how much they disliked that. Recently, Wal-Mart's 1.3 million employees rated scheduling as their most important issue, even above health care (Covert 2006).

Other researchers have shown how overemphasis on short-term performance targets can harm long-term performance at both the firm and plant levels (Mizik and Jacobson 2007; Lovejoy and Sethuraman 2000). Beta store managers, in addition to their annual evaluations, have monthly evaluations according to performance measures such as sales, payroll spending relative to sales, and SQ. I observed some store managers constantly adjusting their payroll spending and underinvesting in labor specifically to meet their monthly payroll targets, although they knew that overstretched employees might start cutting corners or

making mistakes. The practice of setting monthly payroll or profitability targets is not specific to Beta; it is common at many other retailers.

In addition to identifying the perils of paying too much attention to reducing payroll expenses, this study contributes to operations management literature by showing the effects of CQ and SQ on financial performance. One explanation for why SQ has no effect on profit margins at Beta stores may be that their SQ is already high enough. But in fact **Table 1** shows considerable variation in SQ and the median is 84.8, below corporate's target SQ score of 90. So a more likely explanation is that dimensions of SQ such as the responsiveness, empathy, knowledge, and courtesy of the staff may not be key drivers of customer satisfaction at a store where customers shop on their own and expect high product availability. Customer satisfaction in this setting is likely to come from ensuring, through conformance to logistics-related activities, that the right product is in the right location at the right time and with the right information on labels, on shelves, and at in-store terminals.

Yet, Beta headquarters puts more emphasis on SQ than on CQ when evaluating store manager performance. I have found that other retail chains also put surprisingly little emphasis on CQ; many do not even track it. Hence, they are unaware of the magnitude of CQ problems and their impact on performance. This study highlights the importance of ensuring CQ and calls for an increased emphasis on process discipline in some retail contexts.

Sufficient labor combined with performance-management systems that communicate the importance of CQ to store managers and employees can improve CQ. Empirical analyses also show that (a) improving labor planning so that there is a better match between labor plans and the amount of workload at a store, (b) reducing employee and store manager turnover, and (c) reducing complexity in the operating environment can all improve CQ. During my store visits, I also observed that a store manager's style can affect both CQ and SQ. One store manager I interviewed did not mind her employees saving time by hiding extra units underneath display tables rather than placing them in storage areas, but was strict about having fresh flowers in the bathroom. Some managers imposed enough CQ discipline that even a casual observer would notice that their backrooms and display areas were clean and orderly. These operationally

focused store managers likely have a better understanding of what drives customer satisfaction and financial performance at their stores than those managers who pay less attention to in-store logistics and tolerate deviations.

There is opportunity for operations management scholars to study contexts such as retail in which the same employees perform production-like tasks (such as in-store logistics) and customer-service-related tasks. In these settings, the need to ensure CQ and SQ (as well as efficiency) simultaneously makes operations challenging. Customers can frequently interrupt employees performing production-like activities and employees may find themselves facing trade-offs among different dimensions of performance. For example, at checkout in retail stores, handling questions from customers may reduce the efficiency and accuracy of scanning, but focusing on scanning without addressing customer needs may reduce some aspects of SQ. Indeed, after Meijer, a large supermarket chain, implemented engineering standards to measure the speed of its cashiers, some customers were unhappy. They felt they were being pressured by cashiers who needed to perform their checkout tasks more quickly (O'Connel 2008). In addition, because the natures of production-like activities and customer-service-related activities may be very different, these activities may require different employee selection, training, and methods of performance management.

Research can help identify the characteristics that determine the primary performance driver in a particular context and can provide guidelines on how operations in that context should be designed and executed to achieve that driver, including guidelines on the use of limited resources such as labor. For example, this study suggests that, in settings such as Beta, where (a) customers shop on their own, (b) product availability is important, and (c) there is a centralized merchandise planning system, the primary goal of store operations should be to ensure that the right product is in the right location at the right time with the right information. In other settings, however, the primary drivers of customer satisfaction and financial performance may be an empathetic staff, an inviting shopping environment, or personalized help from knowledgeable employees.

Table 1. Descriptive Statistics.

VARIABLES	MEAN	STD DEV	MIN	MAX
SERVICE QUALITY	85.69	7.70	65.50	100
CONFORMANCE QUALITY	0.06	0.62	-2.64	1.31
RETURNS CONFORMANCE	87.63%	8.06%	39.80%	98.23%
STORE CONDITIONS	75.37	11.36	37.00	99.20
PHANTOM PRODUCTS	3.23%	1.75%	0.150%	12.18%
PROFIT MARGIN	9.10%	7.10%	-22.91%	24.76%
SALES	$6,780,135	$2,548,295	$1,794,935	$22,577,389
LABOR	$762,500	$224,515	$247,845	$2,358,044
PLANNING MISMATCH	0.281	0.091	0.085	0.899
EXECUTION MISMATCH	0.151	0.100	0.004	1.011
PROPORTION FULL	55.91%	11.30%	23.72%	88.96%
EMPLOYEE TURNOVER	66.72%	28.77%	4.48%	194.06%
STORE MANAGER TURNOVER	0.13777	0.36077	0	2
TOTAL UNITS	247576	47704	130029	667971
COMPETITORS	0.98618	0.96031	0	5.5
PLAN SALES	$6,949,225	$2,598,872	$378,607	$24,937,453
PLAN PROFIT MARGIN	9.98%	6.52%	-20.04%	24.96%
UNEMPLOYMENT RATE	4.31%	1.65%	1.37%	15.59%

Table 2a. Pearson correlations between average measures of conformance quality across stores (p-values are reported below correlation coefficients).

	RETURNS CONFORMANCE	*PHANTOM PRODUCTS*	*STORE CONDITIONS*
RETURNS CONFORMANCE	1		
PHANTOM PRODUCTS	-0.2674	1	
	<0.0001		
STORE CONDITIONS	0.38759	-0.15842	1
	<0.0001	0.0095	

Table 2b. Pearson correlations between levels of CQ within a store (p-values are reported below correlation coefficients).

	RETURNS CONFORMANCE	*PHANTOM PRODUCTS*	*STORE CONDITIONS*
RETURNS CONFORMANCE	1		
PHANTOM PRODUCTS	-0.09208	1	
	0.0031		
STORE CONDITIONS	0.29857	-0.14332	1
	<0.0001	0.0002	

Table 3. Regression results testing the effect of labor on CQ, SQ and profit margin, and the effect of CQ and SQ on profit margin, sales, and cost.

	DEPENDENT VARIABLE: CONFORMANCE QUALITY	DEPENDENT VARIABLE: SERVICE QUALITY	DEPENDENT VARIABLE: SERVICE QUALITY	DEPENDENT VARIABLE: PROFIT MARGIN	DEPENDENT VARIABLE: PROFIT MARGIN	DEPENDENT VARIABLE: SALES	DEPENDENT VARIABLE: COST
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LABOR (in 100,000s)	0.167 ***	0.581 *	0.441	0.004 **	0.003	424,754 ***	69,667 ***
	(0.055)	(0.327)	(0.319)	(0.002)	(0.002)	(45,931)	(17,436)
CONFORMANCE QUALITY			0.782 ***		0.010 ***	162,669 ***	-22,413 **
			(0.265)		(0.002)	(35,794)	(11,612)
SERVICE QUALITY					0.000	1102.92	2685.67 **
					(0.000)	-3869.04	-1347.22
PLANNING MISMATCH	-0.572 ***	-1.289	-0.785	0.015	0.020 *	-429,828 ***	-163,646 ***
	(0.216)	(1.550)	(1.576)	(0.011)	(0.011)	(163,285)	(60,941)
EXECUTION MISMATCH	-0.218	0.870	1.490	-0.010	-0.008	-263,510 *	22,251
	(0.235)	(1.888)	(1.631)	(0.010)	(0.010)	(140,038)	(62,757)
PROPORTION FULL	0.533	-4.324 **	-4.913 **	-0.022	-0.032 *	-645,943 ***	93,507
	(0.423)	(2.090)	(2.112)	(0.019)	(0.020)	(256,169)	(98,952)
EMPLOYEE TURNOVER	-0.296 **	-1.547 ***	-1.405 **	-0.006	-0.003	1,938	14,962
	(0.121)	(0.600)	(0.602)	(0.005)	(0.005)	-71378	-23891
SM TURNOVER	-0.290 ***	-0.900 ***	-0.694 *	-0.006 **	-0.003	3,870	13,007
	(0.071)	(0.363)	(0.371)	(0.003)	(0.003)	(45072.0)	(14499.0)
TOTAL UNITS (in 100,000s)	-0.517 ***	-0.324	-0.271	-0.002	0.003	-7,871	29,846
	(0.207)	(0.705)	(0.690)	(0.007)	(0.006)	(122,108)	(48,320)
COMPETITORS	-0.071	-0.129	-0.060	-0.013 ***	-0.012 ***	-377,780 ***	-43,012
	(0.087)	(0.384)	(0.381)	(0.003)	(0.003)	(69,746)	(28,808)
PLAN SALES (in 100,000s)	-0.001	-0.084 ***	-0.079 ***	-0.001 ***	-0.001 ***	28,056 ***	
	(0.006)	(0.032)	(0.031)	(0.000)	(0.000)	(4261)	
PLAN PROFIT MARGINS	-2.317 *	3.229	6.911	0.749 ***	0.783 ***	999,637	-2,680,165 ***
	(1.348)	(8.116)	(8.121)	(0.066)	(0.059)	-810058	(314,618)
UNEMPLOYMENT	0.041	0.261	0.320	-0.007 ***	-0.008 ***	-94,250 ***	36,836 ***
	(0.062)	(0.235)	(0.235)	(0.002)	(0.002)	(34,600)	(11,036)
YEAR 1999	0.160	17.384 ***	17.509 ***	-0.006	0.000	52,205	42,462
	(0.109)	(0.655)	(0.637)	(0.004)	(0.006)	(94,769)	(34,657)
YEAR 2000	-0.047	10.270 ***	10.378 ***	-0.015 ***	-0.011 ***	-364,785 ***	38,171
	(0.089)	(0.607)	(0.609)	(0.003)	(0.003)	(62,342)	(24,611)
SALES							0.682 ***
							(0.024)
Observations	682	682	682	682	682	682	682
Adjusted R²	0.455	0.765	0.771				
Chi-Sq				3.90**	2.79*	7.40***	22.55***

*Note: *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Store fixed effects are included in the regressions but not shown in the table. Standard errors reported in parentheses are robust to clustering of observations within stores over time. OLS estimators are used in columns (1), (2), and (3). Maximum likelihood estimators are used in columns (4), (5), (6), and (7).*

Table 4. Regression results testing the effect of labor on individual measures of CQ and the measures of CQ on profit margin.

	DEPENDENT VARIABLE: PHANTOM PRODUCTS (1)	DEPENDENT VARIABLE: PROFIT MARGIN (2)	DEPENDENT VARIABLE: RETURNS CONFORMANCE (3)	DEPENDENT VARIABLE: PROFIT MARGIN (4)	DEPENDENT VARIABLE: STORE CONDITIONS (5)	DEPENDENT VARIABLE: PROFIT MARGIN (6)
PHANTOM PRODUCTS		-0.208 *** (0.053)				
RETURNS CONFORMANCE				0.040 *** (0.011)		
STORE CONDITIONS						0.0003 ** (0.000)
LABOR (in 100,000s)	-0.003 *** (0.001)	0.005 *** (0.001)	0.017 *** (0.006)	0.005 *** (0.001)	3.057 *** (1.032)	0.003 * (0.002)
PLANNING MISMATCH	0.014 *** (0.006)	0.012 (0.009)	-0.047 * (0.026)	0.013 (0.009)	-3.711 (4.903)	0.015 (0.011)
EXECUTION MISMATCH	-0.006 (0.007)	-0.021 *** (0.007)	-0.061 (0.038)	-0.021 *** (0.008)	-7.281 * (4.254)	-0.016 (0.013)
PROPORTION FULL	-0.009 (0.009)	-0.017 (0.012)	0.007 (0.043)	-0.018 (0.013)	3.953 (8.300)	-0.029 (0.020)
EMPLOYEE TURNOVER	0.002 (0.002)	-0.004 (0.003)	-0.039 *** (0.013)	-0.003 (0.003)	-3.675 * (2.250)	-0.005 (0.005)
SM TURNOVER	0.005 *** (0.002)	-0.003 ** (0.002)	-0.035 *** (0.008)	-0.002 (0.002)	-3.521 *** (1.433)	-0.004 (0.003)
TOTAL UNITS (in 100,000s)	0.014 *** (0.003)	-0.003 (0.003)	-0.030 * (0.016)	-0.002 (0.003)	-2.473 (3.717)	0.003 (0.007)
COMPETITORS	0.002 (0.002)	-0.009 *** (0.002)	-0.005 (0.009)	-0.010 *** (0.002)	-0.681 (1.704)	-0.014 *** (0.003)
PLAN SALES (in 100,000s)	0.000 (0.000)	-0.001 *** (0.000)	-0.001 (0.001)	-0.001 *** (0.000)	-0.006 (0.110)	-0.001 *** (0.000)
PLAN PROFIT MARGIN	0.030 (0.029)	0.737 *** (0.058)	-0.071 (0.127)	0.676 *** (0.056)	-19.941 (23.823)	0.713 *** (0.062)
UNEMPLOYMENT	0.000 (0.001)	-0.004 *** (0.001)	0.006 (0.005)	-0.004 *** (0.001)	1.078 (1.143)	-0.008 *** (0.002)
YEAR 1999	-0.007 * (0.003)	0.001 (0.004)	0.010 (0.014)	0.000 (0.004)	-1.488 (2.015)	-0.008 * (0.004)
YEAR 2000	-0.003 (0.003)	-0.009 *** (0.003)	-0.026 ** (0.012)	-0.007 ** (0.004)	-3.884 ** (1.758)	-0.014 *** (0.003)
YEAR 2001	-0.004 ** (0.002)	0.005 ** (0.002)	-0.012 * (0.007)	0.006 *** (0.002)		
Observations	1020	1020	1031	1031	690	690
Adjusted R^2	0.409		0.417		0.327	
Chi-Sq		21.41***		38.73***		7.92***

*Note: *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Store fixed effects are included in all regressions but not shown in the table. Standard errors reported in parentheses are robust to clustering of observations within stores over time. OLS estimators are used in columns (1), (3), and (5). Maximum likelihood estimators are used in columns (2), (4), and (6).*

Table 5. Robustness tests using different estimation or measures of performance.

	DEPENDENT VARIABLE: ΔPROFIT MARGIN	DEPENDENT VARIABLE: ΔPROFIT MARGIN	DEPENDENT VARIABLE: ACTUAL-PLAN PROFIT MARGIN	DEPENDENT VARIABLE: ACTUAL-PLAN PROFIT MARGIN	DEPENDENT VARIABLE: PROFIT MARGIN	DEPENDENT VARIABLE: PROFIT MARGIN
	(1)	(2)	(3)	(4)	(5)	(6)
CONFORMANCE QUALITY		0.006 ***		0.008 ***		0.006 ***
		(0.001)		(0.002)		(0.002)
CONFORMANCE QUALITY $_{T-1}$						0.006 ***
						(0.002)
SERVICE QUALITY		0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)
SERVICE QUALITY $_{T-1}$						0.000
						(0.000)
LABOR (in 100,000s)	0.004 ***	0.003 ***			0.010 ***	0.009 ***
	(0.001)	(0.001)			(0.003)	(0.003)
LABOR $_{T-1}$ (in 100,000s)					0.002	0.002
					(0.002)	(0.002)
ACTUAL-PLAN LABOR			0.002	0.001		
			(0.002)	(0.002)		
PLANNING MISMATCH	0.014 *	0.017 **	0.015 *	0.019 **	0.039 ***	0.046 ***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.014)	(0.014)
EXECUTION MISMATCH	-0.017 ***	-0.014 **	-0.025 ***	-0.024 ***	-0.017 **	-0.018 **
	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
PROPORTION FULL	-0.020 *	-0.024 **	-0.007	-0.011	-0.019	-0.018
	(0.012)	(0.012)	(0.011)	(0.013)	(0.016)	(0.016)
EMPLOYEE TURNOVER	-0.005 **	-0.004	-0.005 *	-0.003	-0.003	0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
SM TURNOVER	-0.002	-0.001	-0.005 ***	-0.003 **	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)
TOTAL UNITS (in 100,000s)	-0.003	-0.002	-0.003	0.001	-0.005	0.001
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
COMPETITORS	-0.011 ***	-0.010 ***	-0.010 ***	-0.009 ***	-0.011 ***	-0.010 **
	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)
PLAN PROFIT MARGIN	0.533 ***	0.562 ***	-0.204 ***	-0.187 ***	0.569 ***	0.549 ***
	(0.039)	(0.040)	(0.038)	(0.061)	(0.166)	(0.178)
PLAN SALES (in 100,000s)	-0.001 ***	-0.001 ***	0.000 **	0.000 ***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
UNEMPLOYMENT	-0.005 ***	-0.004 ***	-0.004 ***	-0.004 ***	-0.007 ***	-0.008 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
YEAR 1999			0.000	0.001		
			(0.004)	(0.005)		
YEAR 2000	-0.002	-0.004	-0.002	-0.002	-0.023 ***	-0.023 ***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.006)	(0.007)
YEAR 2001	0.020 ***	0.017 ***	0.006 ***	0.006 ***	-0.006	-0.006
	(0.002)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)
PROFIT MARGIN $_{T-1}$					-0.401 **	-0.390 *
					(0.189)	(0.224)
Observations	755	755	1020	1020	515	489
Adjusted R^2	0.353	0.37	0.345	0.377		
Chi-Sq					308.4***	332.7***

Note: *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. All variables in columns (1) and (2) except for YEAR 2000 and YEAR 2001 are change variables. Store fixed effects are included in the regressions in columnn (3), (4), (5) and (6) but not shown in the table. Standard errors reported in parentheses are robust to clustering of observations within stores over time. OLS estimators are used in columns (1), (2), (3), (4). Dynamic panel data model of Arrelano and Bond (1991) using the generalized method of moments is used in columns (5) and (6). The conformance quality measure used in this table does not include store conditions.

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