



The Effect of Labor on Profitability: The Role of Quality

Zeynep Ton

Working Paper

09-040

Copyright © 2008 by Zeynep Ton

Working papers are in draft form. This working paper is distributed for purposes of comment and discussion only. It may not be reproduced without permission of the copyright holder. Copies of working papers are available from the author.

The Effect of Labor on Profitability: The Role of Quality

Zeynep Ton
Harvard Business School, Boston, MA 02163, zton@hbs.edu

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. Since employees at retail stores perform both production-related activities and customer-service activities, 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

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,^{1,2} more than 10% of their revenue that year and

¹ Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages for NAICS codes 44-45 (Retail Trade)

² Note that the \$392.97 billion also includes wages of corporate employees.

more than their inventory holding costs.³ Hence, staffing levels have a major impact on retailers' costs. But at the same time, staffing levels affect conformance quality—how well employees execute prescribed processes—and service quality—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 conformance quality and service quality 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 about their effect on profitability. The objective of this paper is to examine how the amount of labor at a store affects profitability through its impact on conformance quality and service quality.

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 higher store sales, as well as from my conversations with retail executives who claim that they often do not have enough labor at their stores 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 attention to the costs and staff their stores at sub-optimal levels (King and Lenox 2002).

To examine the links between labor levels, conformance and service quality, 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 four years. Hence, I am able to control for other factors that may affect conformance quality, service quality, and profitability, including the physical design of the store (Sulek et al. 1995), use of technology (Mithas et al. 2005), service design (Stewart 2003), 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 conformance quality. A one-standard-deviation increase in conformance quality is associated with a 4.1% increase in profit margins. But while I also find that increasing the amount of

³ 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.

labor has a positive impact on service quality, I find no significant relationship between service quality and profit margins. Hence, my analysis suggests that the only mechanism through which store labor affects profitability in my setting is its impact on conformance quality. As for sales, both conformance and service quality mediate the effect of store labor on sales in this particular setting, but the effect of conformance quality is much higher than that of service quality. These results are consistent with the nature of my research site. The retailer I study competes on the basis of ensuring high product availability. Its stores offer a predominantly self-service environment where most customers do not expect or receive personalized attention from a salesperson. In such a retail setting, getting the right product to the right place at the right time may be more important than making sure that customers are satisfied with their overall service experience.

My 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. In short, they choose labor levels that do not maximize profits. These findings are consistent with those of scholars who suggest that, when cost information is more available to managers than benefit information is, managers may tend to pay too much heed to the costs (King and Lenox 2002). They are also consistent with scholars who suggest that managers overemphasize short-term profitability targets at the expense of long-term profitability (Mizik and Jacobson 2007). Strategically, my findings suggest that, in certain service settings, conformance quality can have more impact on profitability than service quality does. This is important because many companies, including my research site, emphasize service quality over conformance quality. For example, at my research site at the time of my study, service quality had a higher weight than conformance quality in store manager evaluations. Hence, store managers were more likely to invest their resources, including labor, in customer-service related tasks than in production-related tasks (Holmstrom and Milgrom 1991).

My study draws from and contributes to the literature on quality's effect on profitability. Although some authors argue for the benefits of bringing process discipline to service settings (Levitt 1972), most

research in these settings focuses on service quality. There is limited evidence for the positive effect of conformance quality on profitability in service settings (Tsikritsis 2007). My study provides further empirical evidence of precisely that effect. Studies that examine the effect of service quality 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 service quality on profitability (Ittner and Larcker 1998).

Conformance quality and service quality are generally seen as measures of operational performance and marketing performance, respectively. Several authors argue for the benefits of examining operational and marketing measures of performance simultaneously (e.g., Roth and Van der Velde 1991) so that their relative importance can be assessed. There is, however, only limited empirical work on this topic. Rust et al. (2002) show that companies that emphasize revenue expansion—a measure of marketing performance in their study—financially outperform companies that emphasize cost reduction—a measure of operational performance in their study, financial performance being measured as managers' perceptions of their firm's financial performance. My findings contradict those of Rust et al. (2002) and suggest that the relative importance of marketing performance versus operational performance would depend on the context.

Finally, this study addresses an important gap in the retail operations literature—the management of labor capacity at the stores. 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 conformance quality as an additional mechanism through which the amount of labor affects a store's financial performance.

This paper proceeds as follows: 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

The objective of this paper is to examine how quality mediates the relationship between labor levels and profitability. Below, I discuss the existing literature that examines how the amount of labor affects quality and how quality affects profitability.

2.1 The Effect of Labor Levels on Quality

Increasing the amount of labor in operating contexts has been associated with increasing both service quality and conformance quality. 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. In addition to increased time with customers, increasing the amount of labor reduces the workload per employee and reduces the likelihood that employees would make errors or cut corners in performing their tasks. In a study of bank operations, Oliva and Sterman (2001) show that, when labor levels are lower employees start cutting corners, which erodes service quality. Roth and Jackson (1995) also say that becoming lean, in terms of decreasing labor capacity, has the hidden cost of reduced service quality. In a different context, Lovejoy and Sethuraman (2000) state that increasing employee workload (assigning more work in a given amount of time) can result in errors or omissions leading to quality problems. All these studies point to a positive relationship between the amount of labor 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: service quality and conformance quality. Consistent with prior literature, service quality in my setting is defined externally by the customer; it measures customers' perceptions of their service experience (Parasuraman et al. 1985). Also consistent with prior literature, conformance quality in my

setting is an internal measure of quality⁴ and is defined as the degree to which stores conform to prescribed standards (Garvin 1988).⁵ Below, I review the literature that examines the effects of service quality and conformance quality on firm profitability. I exclude those studies that examine the effect of Total Quality Management (TQM) practices on firm performance (e.g., Hendricks and Singhal 1997; Easton and Jarrell 1998) because TQM is not a specific measure of quality, but a broad management practice that includes several dimensions such as top-management commitment and supplier relations.

The effect of service quality on profitability

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

Studies at the firm and industry levels offer mixed results about the effect of service quality on profitability. For example, in a study of 140 firms in the U.S., Ittner and Larcker (1998) find a positive relationship between customer satisfaction and market value of equity in a firm. In a longitudinal study of

⁴ 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).

⁵ Note that conformance quality and service quality are not mutually exclusive. Conformance with prescribed processes is one driver of service quality (Parasuraman et al. 1985).

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), with 24 industries represented in their sample, 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) also find a positive relationship between customer satisfaction and return on investment. However, once again, the relationship varies across industries. For example, the authors find that in some industries, such as department stores, gas stations, and supermarkets, firms that have low customer satisfaction also have the highest return on investment. They also find that, while higher customer satisfaction is associated with higher labor productivity for firms producing goods, it is associated with lower labor productivity for service firms, indicating that there is 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 service quality on profitability. Using data from patients discharged from 51 hospitals, Nelson et al. (1992) find that service quality 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 such as margins or return on sales. 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 service quality on profitability suggests that the effect depends on the operating context. Hence, as recommended by Zeithaml (2000), the relationship between service

quality 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 conformance quality 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 conformance quality on operational performance (e.g., Maani et al. 1994; White 1996; Krishnan et al. 2000). Ton and Huckman (2008) show that conformance quality moderates the effect of employee turnover on firm performance. Studies also show a positive association between conformance quality and customer satisfaction (Fynes and Voss 2001; Tsikritsis and Heineke 2004).

But there is limited empirical evidence for the positive effect of conformance quality on financial performance (Sousa and Voss 2002). Using longitudinal data from 10 major airlines, Tsikritsis (2007) finds no relationship between conformance quality, 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 conformance quality 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. They also show that reducing process variation is more important than improving average process performance. Using data from 249 firms in the automotive and computer

industries in Canada, Germany, Japan, and the U.S., 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 service quality to profitability. Using data from 144 branches of a bank in Cyprus, Soteriou and Zenios (1999) examine relationships between operational efficiency, profitability, and service quality and find that operational efficiency and service quality are correlated, but the authors do not report a significantly positive relationship between service quality and profitability. Kamakura et al. (2002) also identify branches of banks that can offer service quality and profits more efficiently.

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

2.3 The Effect of Labor on Profitability through Quality

The literature review above suggests a positive relationship between labor levels and quality. But it also suggests that the relationship between quality and profitability will depend on the specific context. Hence, whether conformance and service quality mediate the effect of labor on profitability at retail stores is likely to depend on how quality affects profitability in that context.

At retail stores, increasing the amount of labor is likely to increase both conformance quality and service quality. When store employees have more time, they are more likely to perform activities such as shelving merchandise or placing price tags on display shelves without making errors. They are also more likely to spend time with customers.

Several authors argue for a positive relationship between service quality and store performance and between conformance quality and store performance. Fisher et al. (2006) show a strong link between overall customer satisfaction and sales. Raman et al. (2001) highlight the frequent occurrence of conformance quality problems at retail stores and argue that these problems are likely to have negative effects not just on immediate sales and profits but also on future sales and profits by affecting the

performance of merchandise-planning systems (Raman et al. 2001). Given these arguments, I hypothesize:

HYPOTHESIS 1: Service quality 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 and increasing service and conformance quality is associated with an increase in profitability.

3. Research Design

3.1 Research Site

I test my hypothesis using data from Beta Corporation⁶, a large specialty retailer. Using data from one company allows me to control for firm-level characteristics that might confound a multi-firm analysis of labor's impact on profitability. In this study, there is no variation in information technology, process design, and monetary incentives across the stores.

I interviewed several executives at Beta, 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 at stores where I observed employees performing their work, including spending time at information desks where I observed employees assisting customers. These interviews and observations were critical in understanding how store managers made labor planning decisions and how store employees as well as corporate managers perceived the importance of various activities at the stores. I complemented my fieldwork with substantial quantitative data. The data collection involved interactions with employees from human resources, store operations, inventory control, and accounting.

3.2 Data and Measures

I use data from all 268 Beta stores that opened before August 1999. Although I obtained monthly data on labor, service quality, and profitability for each store from 1999 to 2002, I was able to obtain only

⁶ The name of the retailer is disguised for confidentiality reasons.

yearly data for two out of the three measures of conformance quality. Hence, my analysis focuses on yearly data. **Table 1** presents descriptive statistics for 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 used return on sales as a measure of profitability. In addition, I prefer profit margin to total profit for the following reason: Total profit is affected by the absolute level of activity, which may depend on factors beyond the store manager's control, such as weather, corporate promotions, or idiosyncratic special events. It is difficult to account for the impact of all of these external factors. Profit margin, on the other hand, controls for differences in the absolute level of activity at the stores.

Labor

The amount of labor is measured as total labor dollars spent at a store in a given year. 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 stores a payroll plan for each month. Each store's payroll plan is based on historical labor dollars spent at that store, prior sales, and the expectation of sales and labor needs in a given period. While store managers use the planned payroll numbers 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 who have different work hours. I do not have access to full-time equivalency for part-time employees.

Service Quality

To measure customers' perception of their service experience, Beta works with a third-party company that sends mystery shoppers to stores. Each store is visited by a mystery shopper once a month. During their visits, mystery shoppers fill out a form with approximately 50 questions, reflecting the five dimensions of service quality. Questions on *tangibles* include whether the restrooms were clean and the facilities in working order, and whether different areas in the stores 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, special order the products). Questions on *reliability* include 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 initiated verbal acknowledgment or greeted the customer and whether employees at the information desk made eye contact. A store's overall customer-service score is based on the mystery shopper's answers to these questions.

Conformance Quality

Beta has developed standard operating procedures for each of its store processes and tracks conformance to several processes via district manager visits, store audits, and collection of process-performance data. Below I describe each of the measures Beta uses to assess store-level conformance.

Returns Conformance Retailers in Beta's category are allowed to return unsold products to manufacturers for a full refund minus the costs of shipping and handling. As at most other retailers in this category, processing returns is a major task at Beta stores; a typical store returns approximately 110,000 units, or 40% of its inventory, every year. At the beginning of each month, Beta's corporate office sends a returns list to each store. The standard operating procedures require stores 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. For the stores, the returns process involves finding the products, packing them, and shipping them to the distribution centers. Between 1999 and 2002, average returns conformance was 87.6% and ranged from 39.8% to 98.2%.

Phantom Products This measure tracks the percentage of products that are in storage areas rather than on the selling floor. Like most other retailers, Beta requires its stores to display at least one unit of every product it carries hence products with no presence on the selling floor are defects in traditional quality terms (Ton and Raman 2008). Note that, in contrast to *returns conformance*, *phantom products* is a

measure of nonconformance. Data on phantom products is collected from physical audits conducted at each store by Beta's Internal Audit Department, working in collaboration with a specialized third party. Store audits are performed once a year at each store between February and October; stores are closed during their audits. Between 1999 and 2002, *phantom products* averaged 3.2% and ranged from 0.15% to 12.2%.

Store Conditions This composite score tracks a store's conformance to a wide range of standards, such as display-shelf organization, presentation of store fixtures, and maintenance of shelf labels in the backrooms. The store-conditions report is generated once a quarter from regional directors' store visits. It has four categories—three relating to three major product groups and one relating to store operations—each divided into sections. For example, one product category is divided into sections including shelf organization, endcaps, overstock, and product flow. Each of these sections is further divided into items. For example, shelf organization section is divided into items including fullness and shelf labels. Stores receive a score for each of the items. The average of these scores is the score for the specific section. Section scores are weighted and then summed to create the total store-conditions score. I was able to obtain only three years of data for store conditions. Between 1999 and 2001, the average store-conditions score was 75.4 (out of 100) and ranged from 37 to 99.2.

Composite Measure of Conformance Quality

Tables 2a and **2b** present correlations among the three conformance-quality measures. **Table 2a** presents correlations among average conformance-quality measures for each store and **Table 2b** presents correlations among levels of conformance quality, which are calculated for each store by subtracting the conformance-quality measure from the average conformance-quality measure for that store. **Table 2a** shows a statistically significant correlation among average measures of conformance quality across stores. That is, stores that conform well to one measure typically conform well to other measures. **Table 2b** shows significant correlation in the level of conformance quality *within* a store.

To create a composite measure of conformance quality, I first standardize each of the measures of conformance quality for each year, then take the average of these standardized scores. Note that, in taking

the average, I add scores of returns conformance and store conditions, which are measures of conformance, and subtract scores of phantom products, which is a measure of nonconformance.

3.3 Empirical Model

To test whether conformance quality and service quality mediates the effect of labor levels on profit margins, four equations need to be estimated (Barron and Kenny, 1986): one that regresses the mediators (conformance quality and service quality) on the independent variable (labor), one that regresses the dependent variable (profit margin) on the independent variable (labor) and one that regresses the dependent variable on both the independent variable and on the mediators. These equations are shown below:

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

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

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

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

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, conformance quality, service quality, 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.

Equations (1), (2), (3), and (4) also include the vector X_{it} , which contains ten store-level time-varying variables. One element of X_{it} is the *planning mismatch* variable, which measures the degree of mismatch between a store's payroll plans and its actual workload; this controls for the quality of labor planning done by the corporate office. X_{it} also includes *execution mismatch*, which measures the degree of mismatch between payroll plans and actual labor spending; this controls for how much store managers deviate from payroll plans. I follow Fisher et al.'s (2007) methodology to create planning mismatch and

execution mismatch variables and use monthly sales as a proxy for the amount of workload at a store. I first create 12 monthly seasonality factors for sales, payroll plans, and actual payroll dollars spent for each store for each year. I then 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 the correlation between the seasonality factor for payroll plans and the seasonality factor for actual payroll dollars spent from 1.

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 as a result of employees' departure, 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 area⁷ 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 store profitability. We may observe a relationship between store profits and store labor because store managers increase labor capacity in expectation of high sales. To control for endogeneity, vector X_{it} includes planned payroll and planned sales. Planned sales at a store for a given period represents what Beta corporate expects sales at the stores to be for that period. Planned payroll represents the amount of payroll corporate budgets for a store for a particular period.

We can expect profitability in year t to be correlated with financial performance in year $t-1$. As a result, in equations (3) and (4), I consider a flexible structure of the variance-covariance matrix of the errors with first-order autocorrelations. I estimate the parameters of equations (1) and (3) using maximum likelihood estimation using Beach and MacKinnon's (1978) algorithm (Greene 2000). For equations (2) and (3), I use ordinary least squares (OLS) estimators and report the heteroskedasticity robust standard errors for OLS as recommended by Huber (1967) and White (1980).

⁷ Source: Bureau of Labor Statistics

The relationships between store labor and conformance and service quality, between store labor and profitability, and between conformance and service quality and profitability are all expected to be nonlinear. To test for nonlinearity between store labor and conformance quality and service quality, I estimate models where I use the log of store labor in equations (1) and (2). I also use two other specifications: I estimate models in which I include a squared term for labor and models in which store labor interacts with three categories of labor. 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 three categories of labor—high, medium, low. These categories are created by ranking and then dividing stores into thirds based on their labor spending in a year. Finally, to test for nonlinearity between conformance quality and profitability and between service quality and profitability, I estimate equation (4) using log of conformance quality and log of service quality as well as including interactions between conformance quality and service quality with three categories of conformance quality and service quality, respectively.

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 conformance quality and service quality, respectively. The results show that increasing labor at a store is associated with higher conformance quality and higher service quality. As shown in **Table 4**, increasing labor is associated with better overall conformance to each of the individual measures of conformance quality. There is no evidence of a nonlinear effect of store labor on conformance quality or on service quality. Log of store labor, quadratic term for store labor, and interactions of store labor with different levels of labor are not significant when using either conformance quality or service quality as dependent variables; they are not reported. These results suggest that the level of labor at Beta stores is low enough that adding more labor would still improve conformance quality or service quality or both.

In terms of magnitude, increasing labor capacity has a stronger effect on conformance quality than on service quality. A one-standard-deviation increase in store labor is associated with a 0.78-standard-deviation increase in conformance quality but only a 0.23-standard-deviation increase in service quality. One potential explanation for this result is that store managers pay a lot more attention to customer-service-related activities than to production-related activities. When I asked store managers to identify the top three indicators of store performance, almost all mentioned customer service, but none mentioned process discipline or consistent execution of production-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 conformance quality is not surprising, as the firm’s own internal measures emphasize customer-service-related activities over production-related activities. At the time of my study, the service quality measure had a 20% weight in store manager evaluations. But measures of conformance quality had lower weights: Store conditions had only a 10% weight, returns conformance had a weight less than 1%, and phantom products had no weight. As a result, store managers are more likely to invest their resources (including labor) in customer-service-related tasks than in production-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 result in reallocations of the agent’s effort away from other activities.

The effect of conformance quality and service quality on profitability

Column (6) of **Table 3** presents results for testing the effect of conformance quality and service quality on store profit margin when using maximum likelihood estimators with auto-correlated errors. Similar results are obtained when using OLS estimators. The composite measure of conformance quality is

positive and significant at the 1% level. Individual measures of conformance quality are also positive and significant (see **Table 5**). Moreover, as shown in Column (3) of Table 5, conformance quality also has a positive and significant effect on service quality. Service quality, on the other hand, has no statistically significant effect on profit margins. It also is not significant when conformance quality is not included as an independent variable, which is not reported here. I also estimated models where I used sales as a measure of financial performance. Consistent with prior studies, I found a positive effect of service quality on sales, but the effect became insignificant when conformance quality was also included as an independent variable.

These results show that despite the retailer's emphasis on service quality, conformance quality is more associated with financial performance than service quality is. In the context of Beta stores, in addition to its positive impact on store sales, conformance quality is likely to improve labor productivity and reduce shrinkage. When there is order in the stores, employees are less likely to waste time searching for products or double-checking the system. For example, during two of my store visits, I spent several hours at the information desk, where employees help customers face-to-face as well as taking phone calls. An employee who received a call from a customer asking if a product were available would physically check to make sure he or she could find the product even when the computer system indicated that the store had multiple units. This often took considerable time. At stores with high process discipline, employees are more likely to trust that the products will be in the right location, making a physical check unnecessary.

Direct and indirect effect of labor on profitability

Columns (4) and (5) of **Table 3** report results of the effect of store labor on profitability when using maximum likelihood estimators with auto-correlated errors. Similar results were obtained when using OLS estimators. As reported in column (4), the coefficient of store labor is positive and significant when using profit margin as the dependent variable. **Table 3**, Column (4) shows that, all else being constant, a one-standard-deviation increase in store labor (\$224,515 increase) is associated with a with a 0.9-percentage-point increase in profit margin, a 10% increase.

As shown in Column (5), there is no evidence of a nonlinear effect of store labor on store profitability. The quadratic term for store labor is insignificant. The interactions with the three levels of store labor are also insignificant and are not reported. These results once again suggest that Beta stores generally operate with low enough levels of labor that the cost of additional labor would not outweigh its benefit. One potential reason for operating with such low levels of labor could be that labor is unavailable, but during my store visits, store managers did not indicate that availability was a problem. To further check whether labor availability might have caused stores to have less labor than was optimal, I 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 amount of labor in stores, we would expect stores in areas with low unemployment rates to have more payroll execution mismatch. But the correlation is statistically insignificant.

My field observations at Beta stores as well as conversations with retail executives at other firms suggest that the reason retail stores are generally understaffed is because of companies' emphasis on minimizing payroll expenditures. I observed that some store managers were constantly adjusting their payroll dollars spent and that many of them were underinvesting in store labor, specifically in order to meet their monthly payroll targets, although they were aware that when they did not have enough labor, employees might start cutting corners or making mistakes. One Beta store manager told me:

"We are given monthly plans [payroll as a percentage of sales plans] and weekly plans, but the monthly plan counts. In my particular store, we are always chronically under our plan because we budget things too conservatively, I feel—but partly because of the way the bonus is. I hope they change the bonus so that if you are a percent over [the plan] or under [the plan] you get a 5. Unfortunately, it's now just minus. The lower you go, it's a 5, so that prejudices you, if you are goal-oriented—and we here are goal-oriented, too much I think—to go low, which is not good for other factors in the store."

To test the indirect effect of labor on profitability through its impact on conformance quality, I use the formula developed by Sobel (1982) and calculate the standard errors associated with $\beta\gamma$, where β is the

effect of labor on conformance quality and γ is the effect of conformance quality on profitability ($H_0: \beta\gamma=0$).

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

The indirect effect of store labor on profit margin, through its impact on conformance quality of .0013 = (.217*.006), is significant at the 2% level. The indirect effect is also significant when using individual measures of conformance quality as mediators. Note that the coefficient of store labor in Column (6) of **Table 3** is statistically insignificant, suggesting that conformance quality is the mechanism through which store labor positively affects profit margins.

5. Conclusion

5.1 The Role of Incentives

My findings suggest that too much corporate emphasis on payroll management may motivate store managers to operate their stores with insufficient labor capacity which, in turn, degrades financial performance. While the negative effect of cutting payroll spending is often difficult to quantify and is not immediately felt, the negative effect of increasing payroll spending makes itself felt immediately in lower profit margins, which might result in failing to meet short-term profitability targets. Managers' overemphasis on meeting short-term performance targets at the expense of long-term performance has been highlighted both at the firm level and at the plant level (Mizik and Jacobson 2007; Lovejoy and Sethuraman 2000).

Emphasis on payroll management can also degrade employee morale. Beta store managers often reduce labor spending by changing employee schedules and reducing employees' hours, a common approach practiced at other retail chains. Several employees told me how much they disliked that. There is evidence that employees at other retailing contexts are also unhappy about this practice. Wal-Mart's 1.3 million employees, for example, rate scheduling as their most important issue, even above health care (Covert 2006).

5.2. The Role of Process Discipline at Retail Stores

In my study, the mechanism through which store labor increases profit margins is conformance quality and not service quality. A one-standard-deviation increase in conformance quality is associated with a 4.1% increase in store profit margins. This finding suggests that when ensuring product availability is important and when offering environments where customers shop on their own is important (e.g. supermarkets, general merchandise stores, drug stores, and some specialty retailers), conformance quality is an important driver of financial performance. This has several implications for management.

In such settings, it is important to design processes so that they are simple and easy to follow, especially when there is high employee turnover, as in the retail industry. Good process design needs to be backed up with an organizational culture that emphasizes conformance to these processes.

When production-related activities and customer-service activities are both required, sometimes of the same employees, management may be challenging. Several authors argue for different management approaches depending on the nature of the task being performed. Tasks that involve *exploitation*, where known activities are performed repeatedly, are often associated with a management approach that emphasizes process discipline. Tasks that involve *exploration*, where new processes, strategies, or technologies are explored, are often associated with a management approach that emphasizes experimentation, learning, and risk taking (March 1991; Sitkin et al. 1994). Although it is possible for exploitation and exploration to coexist, several researchers argue that one approach often dominates (Levinthal and March 1993). Hence, in a retail context where employees perform both exploration activities (e.g., resolving customers' problems) and exploitation activities (e.g., production-related activities as well as some customer service activities such as helping customers during checkout), the dominant management approach used should depend on the relative importance of these different types of activities on store profitability.

Particular businesses will have idiosyncratic reasons to emphasize process discipline. Beta stores, for example, compete on the basis of ensuring product availability—getting the right product to the right place at the right time. Conformance quality clearly is a critical factor in ensuring product availability

(Ton and Raman 2008). Moreover, Beta has invested heavily in a centralized merchandising system that determines which products a store should carry and the quantity of each product. The performance of this system depends not only on good algorithms, but also on good execution at the stores. Beta has also invested in in-store technologies so that customers will require less help from employees. Such technology cannot be put to optimal use without good process performance.

My findings show no trade-off between conformance quality and service quality at Beta stores. In fact, increasing conformance quality is associated with an increase in service quality. Hence in an environment where customers shop on their own, emphasizing process discipline may result in better service experience for customers. This may not be the case for other retailers. For example, Home Depot competes by having knowledgeable employees who not only help customers find the right products but even explain how to use them. Traditionally, Home Depot stores were run informally by store managers, who were often encouraged to ignore directives from corporate headquarters. But in 2000, Home Depot recruited Bob Nardelli, a former General Electric executive, as CEO. Nardelli firmly believed in the role of process discipline; he changed the culture at Home Depot from one that valued entrepreneurial spirit to one that emphasized process discipline. During his tenure, Home Depot's customer service suffered, as did its stock price. Although many things other than Nardelli's emphasis on process discipline may explain the decline in customer service and stock price, several observers noted that this emphasis did damage Home Depot's service quality and therefore its stock-market performance (Ton and Ross 2008).

5.3 Limitations of the Findings

A weakness of my research design is that I am not always able to observe the specific causes of nonconformance with prescribed standards. For two of the three conformance quality measures (returns conformance and phantom products), nonconformance results from employees making mistakes or cutting corners. Store employees have no reason to deliberately leave products in backrooms or not return the products to the distribution centers. But in the case of the third measure, store conditions, I did observe deliberate nonconformance at some stores. 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.

As with most other case studies, focusing on a single firm limits the generalizability of my results. While increasing labor capacity is likely to be associated with higher service quality and conformance quality in many other settings, such as hospitals, restaurants, and other retail contexts, the relative effects of conformance quality and service quality are likely to differ across contexts. For example, at high-end department stores, furniture stores, or jewelry stores, where consultative selling is important, service quality may have more of an impact on profitability than conformance quality would. This may also be the case at retailers that offer differentiated products. Because Beta carries undifferentiated products (a customer can easily buy a particular product at another store if Beta does not have it), managing product availability—and thus the need for process discipline—may be more important. There is an opportunity for researchers to examine conformance quality and service quality in other settings and to examine the drivers of these factors as well as their relative impact on profitability.

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%
PHANTOM PRODUCTS	3.23%	1.75%	0.150%	12.18%
STORE CONDITIONS	75.37	11.36	37.00	99.20
SALES	\$6,780,135	\$2,548,295	\$1,794,935	\$22,577,389
PROFIT MARGIN	9.10%	7.10%	-22.91%	24.76%
LABOR DOLLARS SPENT	\$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-TIMERS	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 # OF UNITS	247576	47704	130029	667971
# OF COMPETITORS	0.98618	0.96031	0	5.5
PLAN PAYROLL	\$786,125	\$235,253	\$48,061	\$2,797,207
PLAN SALES	\$6,949,225	\$2,598,872	\$378,607	\$24,937,453
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 <0.0001	1	
STORE CONDITIONS	0.38759 <0.0001	-0.15842 0.0095	1

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

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

Table 3. Regression results testing the effect of labor on conformance and service quality, the effect of labor on profit margins, and the effect of conformance and service quality on profit margins.

	DEPENDENT VARIABLE: CONFORMANCE QUALITY (1)	DEPENDENT VARIABLE: SERVICE QUALITY (2)	DEPENDENT VARIABLE: SERVICE QUALITY (3)	DEPENDENT VARIABLE: PROFIT MARGIN (4)	DEPENDENT VARIABLE: PROFIT MARGIN (5)	DEPENDENT VARIABLE: PROFIT MARGIN (6)
LABOR (in 100,000s)	0.2165 *** (0.056)	0.7891 ** (0.405)	0.848 * (0.466)	0.004 * (0.002)	-0.0004 (0.003)	0.004 (0.003)
LABOR2 (in 100,000s)					0.0002 (0.000)	
CONFORMANCE QUALITY			1.144 *** (0.414)			0.006 *** (0.002)
SERVICE QUALITY						-0.0003 (0.0003)
PLANNING MISMATCH	-0.481 ** (0.231)	-0.980 (1.525)	0.994 (1.894)	0.016 (0.011)	0.016 (0.011)	0.020 (0.013)
EXECUTION MISMATCH	-0.271 (0.234)	0.813 (1.898)	2.383 (2.255)	-0.015 ** (0.007)	-0.016 ** (0.007)	-0.003 (0.011)
PROPORTION FULL	0.474 (0.417)	-4.225 ** (2.093)	-9.951 *** (3.256)	-0.024 * (0.013)	-0.020 (0.013)	-0.027 (0.023)
EMPLOYEE TURNOVER	-0.288 ** (0.124)	-1.483 *** (0.600)	-0.7836 (0.845)	-0.005 * (0.003)	-0.0059 * (0.003)	-0.0041 (0.006)
SM TURNOVER	-0.273 *** (0.072)	-0.881 ** (0.363)	-0.588 (0.55)	-0.003 (0.002)	-0.002 (0.00)	-0.005 (0.00)
UNITS (in 100,000s)	-0.491 ** (0.209)	-0.310 (0.716)	-0.948 (1.480)	-0.004 (0.015)	-0.002 (0.005)	-0.008 (0.009)
COMPETITORS	-0.080 (0.089)	-0.074 (0.389)	-0.064 (0.537)	-0.009 *** (0.003)	-0.009 *** (0.003)	-0.006 (0.004)
PLAN PAYROLL (in 100,000s)	-0.096 *** (0.005)	-0.413 (0.434)	-1.1280 ** (0.576)	-0.003 (0.002)	-0.0046 * (0.002)	-0.0049 (0.004)
PLAN SALES (in 100,000s)	-0.003 *** (0.001)	-0.060 * (0.031)	-0.0068 (0.046)	0.001 *** (0.000)	0.0012 *** (0.000)	0.0012 *** (0.000)
UNEMPLOYMENT	0.040 (0.061)	0.273 (0.236)	-0.026 (0.385)	-0.004 *** (0.002)	-0.004 *** (0.002)	-0.006 ** (0.002)
YEAR 1999	0.146 (0.113)	17.152 *** (0.643)	16.286 *** (0.822)	-0.011 ** (0.005)	-0.011 ** (0.006)	-0.009 (0.007)
YEAR 2000	0.042 (0.103)	10.462 *** (0.651)	9.699 *** (0.784)	-0.012 *** (0.004)	-0.010 ** (0.005)	-0.015 *** (0.005)
YEAR 2001		1.208 *** (0.343)		0.005 * (0.003)	0.005 ** (0.002)	
Observations	682	1,031	682	1,031	1,031	682
Adjusted R ²	0.455	0.789	0.776	-3,354	-3,345	-1,637
F-statistic	3.09***	14.83***	9.64***	206.63***	207.01***	29.63***

Note: *, **, *** 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 are reported in parenthesis. Standard errors are heteroskedasticity robust. Maximum likelihood estimators are used in Columns (4), (5) and (6). OLS estimators are used in Columns (1), (2) and (3).

Table 4. Regression results testing the effect of labor on individual measures of conformance quality.

	<i>DEPENDENT VARIABLE: RETURNS CONFORMANCE</i>	<i>DEPENDENT VARIABLE: PHANTOM PRODUCTS</i>	<i>DEPENDENT VARIABLE: STORE CONDITIONS</i>
	(1)	(2)	(3)
<i>LABOR (in 100,000s)</i>	0.024 *** (0.008)	-0.003 * (0.001)	3.459 *** (0.982)
<i>PLANNING MISMATCH</i>	-0.038 (0.025)	0.015 *** (0.006)	-3.115 (5.081)
<i>EXECUTION MISMATCH</i>	-0.065 * (0.038)	-0.006 (0.006)	-7.784 * (4.285)
<i>PROPORTION FULL</i>	0.009 (0.043)	-0.009 (0.009)	3.421 (8.189)
<i>EMPLOYEE TURNOVER</i>	-0.037 *** (0.013)	0.002 (0.002)	-3.586 (2.270)
<i>SM TURNOVER</i>	-0.034 *** (0.008)	0.005 *** (0.002)	-3.397 ** (1.456)
<i>TOTAL UNITS (in 100,000s)</i>	-0.030 ** (0.016)	0.015 *** (0.003)	-2.304 (3.715)
<i>COMPETITORS</i>	-0.004 (0.009)	0.002 (0.002)	-0.786 (1.735)
<i>PLAN PAYROLL (in 100,000s)</i>	-0.013 * (0.007)	-0.001 (0.002)	-0.728 (1.493)
<i>PLAN SALES (in 100,000s)</i>	-0.001 (0.000)	0.000 (0.000)	-0.032 (0.131)
<i>UNEMPLOYMENT</i>	0.007 (0.005)	0.000 (0.001)	1.055 (1.137)
<i>YEAR 1999</i>	0.006 (0.014)	-0.007 ** (0.003)	-1.570 (2.126)
<i>YEAR 2000</i>	-0.018 (0.011)	-0.003 (0.003)	-3.216 *** (2.095)
<i>YEAR 2000</i>	-0.013 * (0.007)	-0.005 ** (0.002)	
Observations	1031	1020	690
Adjusted R ²	0.422	0.417	0.327

Note: *, **, *** 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 are reported in parenthesis. Robust standard errors are reported when using OLS.

Table 5. Regression results testing the effect of individual measures of conformance quality on store profit margins.

	DEPENDENT VARIABLE: PROFIT MARGIN	DEPENDENT VARIABLE: PROFIT MARGIN	DEPENDENT VARIABLE: PROFIT MARGIN
	(1)	(2)	(3)
RETURNS CONFORMANCE	0.026 ** (0.011)		
PHANTOM PRODUCTS		-0.113 ** (0.051)	
STORE CONDITIONS			0.0002 * (0.000)
LABOR (in 100,000s)	0.003 (0.002)	0.004 * (0.002)	0.004 (0.003)
PLANNING MISMATCH	0.017 (0.011)	0.019 (0.013)	0.021 (0.013)
EXECUTION MISMATCH	-0.013 * (0.007)	-0.013 * (0.007)	-0.009 (0.011)
PROPORTION FULL	-0.023 * (0.014)	-0.025 * (0.013)	-0.023 (0.023)
EMPLOYEE TURNOVER	-0.005 (0.003)	-0.004 (0.003)	-0.006 (0.005)
SM TURNOVER	-0.001 (0.002)	-0.002 (0.002)	-0.005 (0.003)
TOTAL UNITS (in 100,000s)	-0.002 (0.005)	-0.004 (0.006)	-0.004 (0.009)
COMPETITORS	-0.009 *** (0.003)	-0.008 *** (0.003)	-0.007 (0.004)
PLAN PAYROLL (in 100,000s)	-0.003 (0.002)	-0.003 (0.002)	-0.005 (0.004)
PLAN SALES (in 100,000s)	0.001 *** (0.000)	0.001 *** (0.000)	0.001 *** (0.000)
UNEMPLOYMENT	-0.004 ** (0.002)	-0.004 ** (0.002)	-0.006 ** (0.003)
YEAR 1999	-0.010 * (0.006)	-0.008 (0.005)	-0.015 *** (0.005)
YEAR 2000	-0.011 ** (0.004)	-0.013 *** (0.004)	-0.016 *** (0.004)
YEAR 2001	0.006 ** (0.002)	0.004 * (0.002)	
Observations	1,031	1,020	690
-2.loglikelihood ratio	-3,365	-3,329	-1,677
Chi-sq	213.00***	194.37***	31.51***

Note: *, **, *** 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 are reported in parenthesis and are heteroskedasticity robust. Maximum likelihood estimators are used.

References

- Anderson, E.W., C. Fornell, S. Mazvancheryl. 2004. Customer satisfaction and shareholder value. *Journal of Marketing* **68**(4) 172-185.
- Anderson, E.W., C. Fornell, R. Rust. 1997. Customer satisfaction, productivity, and profitability: differences between goods and services. *Marketing Sci.* **16**(2) 129-145.
- Banker, R.D, L. Seok-Young, P. Gordon. 1996. A field study of the impact of a performance-based incentive plan. *Journal of Accounting & Economics* **21**(3) 195-226.
- Baron, R.M., D.A. Kenny. 1986. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* **51**(6) 1173-1182.
- Beach, C.M., J.G. MacKinnon. 1978. A maximum likelihood procedure for regression with autocorrelated errors. *Econometrica* **46**(1) 51-58.
- Corbett C.J., M.J. Montes-Sancho, D. A. Kirsch. 2005. The financial impact of ISO 9000 certification in the United States: an empirical analysis. *Management Science* **51**(7) 1046-1059.
- Collier, D.A. 1991. A service quality process map for credit card processing. *Decision Sciences* **22**(2) 406.
- Covert, J. Wal-Mart tightens work-shift rules. *The Wall Street Journal* May 3 2006.
- Crosby, P.B. 1980. *Quality is Free*. Mentor, New York.
- Easton, G., S.L. Jarell. 1998. The effects of total quality management on corporate performance. *Journal of Business* **71**(2) 253-308.
- Fine, C.H. 1986. Quality improvement and learning in productive systems. *Management Science* **32**(10) 1301-1315.
- Fisher M.L., J. Krishnan, S. Netessine. 2006. Retail store execution: an empirical study. Working paper.
- Fisher M.L., J. Krishnan, S. Netessine. 2007. The impact of payroll planning and execution on retail store performance. Working paper.

- Frei F.X., R. Kalakota, A.J. Leone, L.M. Marx. 1999. Process variation as a determinant of bank performance: evidence from the retail banking study. *Management Science* **45**(9) 1210-1220.
- Fynes B., C. Voss. 2001. A path analytic model of quality practices, quality performance, and business performance. *Production and Operations Management* **10**(4) 494-513.
- Garvin, D.A. 1987. Competing on the eight dimensions of quality. *Harvard Business Review* **65**(6) 101-109.
- Garvin, D.A. 1988. *Managing Quality*. The Free Press, New York.
- Greene, W.H. 2000. *Econometric Analysis*. Prentice Hall, Upper Saddle River, New Jersey.
- Gupta, S., V. Zeithaml. 2006. Customer metrics and their impact on financial performance. *Marketing Science* **25**(6) 718-739.
- Hallowell, R, L.A. Schlesinger, J. Zornitsky. 1996. Internal service quality, customer and job satisfaction: Linkages and implications for management. *Human Resource Planning* **19**(2) 20-31.
- Hendricks, K.B., V.R. Singhal 1997. Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science* **43**(9) 1258-1274.
- Heskett, J.L., T.O. Jones, G.W. Loveman, W.E. Jr Sasser, L.A. Schlesinger. 1994. Putting the service-profit chain to work. *Harvard Business Review* **72**(2) 164.
- Heskett, J.L., W.E. Sasser, Jr., L.A. Schlesinger. 1997. *The Service Profit Chain*. New York: Free Press.
- Holmstrom, B., P. Milgrom. 1991. Multitask principal-agent analyses: incentive contracts, asset ownership, and job design. *Journal of Law, Economics, and Organization* **7** 24-52.
- Hopp, W.J., S.M.R. Iravani, G.Y. Yuen. 2007. Operations systems with discretionary task completion. *Management Science*, **53**(1) 61-77.
- Huber, P.J. 1967. The behavior of maximum likelihood estimates under nonstandard conditions, *Proceedings of Fifth Berkeley Symposium in Mathematical Statistics* **1** 221-233.

- Ittner, C., D. Larcker. 1997. The performance effects of process management techniques. *Management Science* **43**(4) 523-534.
- Ittner, C., D. Larcker. 1998. Are non-financial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research* **36**(3) 1-35.
- Kamakura W., V. Mittal, F.de Rosa, J.A. Mazzon. 2002. Assessing the service-profit chain. *Marketing Science* **21**(3) 294-317.
- King, A., M. Lenox. 2002. Exploring the locus of profitable pollution reduction. *Management Science* **48**(2) 289-299
- Krishnan, M.S., C.H. Kriebel, S. Kekre, T. Mukhopadhyay. 2000. An empirical analysis of productivity and quality in software products. *Management Science* **46**(6) 745-759.
- Levinthal, D.A., J.G. March. 1993. The myopia of learning. *Strategic Management Journal* **14** 95-112.
- Levitt, T. 1972. Production-line approach to services. *Harvard Business Review* **50**(4) 41-52.
- Li G., S. Rajagopalan. 1998. Process improvement, quality, and learning effects. *Management Science* **44** (11) 1517-1532.
- Lovejoy, W.S., Sethuraman. 2000. Congestion and complexity costs in a plant with fixed resources that strives to make schedule. *Manufacturing & Service Operations Management* **2**(3) 221-239.
- Loveman, G. 1998. Employee, satisfaction, customer loyalty, and financial performance: An empirical examination of the service profit chain in retail banking. *Journal of Service Research* **1**(1) 18-31.
- Maani, K.E., M.S. Putterill, D.G. Sluti. 1994. Empirical analysis of quality improvement in manufacturing. *International Journal of Quality and Reliability Management* **11**(7) 19-37.
- March, J. 1991. Exploration and exploitation in organizational learning. *Organization Science* **2**(1) 71-87.
- Mithas, S., M.S. Krishnan, C. Fornell. 2005. Why do customer relationship management applications affect customer satisfaction? *Journal of Marketing* **69**(4) 201-209.
- Mittal, V., E.W. Anderson, A. Sayrak, P. Tadikamalla. 2005. Dual Emphasis and the Long-Term Financial Impact of Customer Satisfaction. *Marketing Science* **24**(4) 544-555.

- Mizik, N., R. Jacobson. 2007. Myopic marketing management: evidence of the phenomenon and its long-term performance consequences in the SEO context. *Marketing Science* **26**(3) 361-379.
- Nelson, E., R. Rust, A. Zahorik, R. Rose, P. Batalden, B.A. Siemanski. 1992. Do patient perceptions of quality relate to hospital financial performance? *Journal of Health Care Marketing* **12**(4) 6-13.
- Oliva, R., J.D. Sterman. 2001. Cutting corners and working overtime: quality erosion in the service industry. *Management Science* **47**(7) 894-914.
- Parasuraman, A., V.A. Zeithaml, B.L. Leonard. 1985. A conceptual model of service quality and its implications for future research. *Journal of Marketing* **49**(Fall) 41-50.
- Raman, A., DeHoratius, N. and Z. Ton. 2001. Execution: the missing link in retail operations. *California Management Review* **43**(3) 136-152.
- Roth, A.V., Jackson III. 1995. Strategic determinants of service quality and performance: evidence from banking industry. *Management Science* **41**(11) 1720-1733.
- Roth, M., V. der Velde. 1991. Operations as marketing: a competitive strategy. *J. Oper. Management* **10**(2) 303-329.
- Rust, R., A. Zahorik, T.L. Keiningham. 1995. Return on quality: making service quality financially accountable. *Journal of Marketing* **59**(2) 58-71.
- Rust, T.R., C. Moorman, P.R. Dickson. 2002. Getting return on quality: revenue expansion, cost reduction, or both? *Journal of Marketing* **66**(4) 7.
- Sitkin, S.B., K.M. Sutcliffe, R.G. Schroeder. 1994. Distinguishing control from learning in total quality management a contingency perspective. *Academy of Management* **19**(3) 537-564.
- Sobel, M.E. 1982. Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.). *Sociological Methodology*. Washington DC. *American Sociological Association* 290-312.
- Soteriou, A., S.A. Zenios. 1999. Operations, quality, and profitability in the provision of banking services. *Management Science* **45**(9) 1221.

- Sousa, R., C.A. Voss. 2002. Quality management re-visited: a reflective review and agenda for future research. *Journal of Operations Management* **20**(1) 91-109.
- Stewart, D. 2003. Piecing together service quality: a framework for robust service. *Production and Operations Management* **12**(2) 246.
- Sulek, J.M., M.R. Lind, A.S. Maruchek. 1995. The impact of a customer service intervention and facility design on firm performance. *Management Science* **41**(11) 1763-1773.
- Ton, Z., R.S. Huckman. 2008. Managing the impact of employee turnover on performance: the role of process conformance. *Organization Science* **19**(1) 56-68.
- Ton, Z., A. Raman. 2008. The effect of product variety and inventory levels on retail. Store sales: a longitudinal study. Harvard Business School Working Paper.
- Ton, Z., C. Ross. 2008. The Home Depot, Inc. Harvard Business School case.
- Tsikriktsis, N. 2007. The effect of operational performance and focus on profitability: a longitudinal study of the U.S. airline industry. *Manufacturing and Service Operations Management* **9**(4) 506-517.
- Tsikriktsis, N., J. Heineke. 2004. The impact of process variation on customer dissatisfaction: evidence from U.S. domestic airline industry. *Decision Sci.* **35**(1) 129-142.
- White, H. 1980. A Heteroskedasticity-consistent covariance matrix estimator and a direct test for Heteroskedasticity. *Econometrica* **48** 817 -838.
- White, G. 1996. A meta-analysis model of manufacturing capabilities. *Journal of Operations Management* **14**(4) 315-331.
- Zeithaml, V.A. 2000. Service quality, profitability and the economic worth of customers: what we know and what we need to learn. *Journal of the Academy of Marketing Science* **28**(1) 67-85.