The Link between Supply Chain Fit and Financial Performance of the Firm

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Abstract

The bottom-line financial impact of supply chain management has been of continuing interest. Building on the operations strategy literature, Fisher's (1997) conceptual framework, a survey of 259 U.S. and European manufacturing firms, and secondary financial data, we investigate the relationship between supply chain fit (i.e., strategic consistencies between the products' supply and demand uncertainty and the underlying supply chain design) and the financial performance of the firm. The findings indicate that the higher the supply chain fit, the higher the Return on Assets (ROA) of the firm, and that firms with a negative misfit show a lower performance than firms with a positive misfit.

Key words: supply chain management; operations strategy; supply chain fit; empirical analysis; firm performance

1. Introduction

Although it is intuitive that supply chain management is likely to have a positive impact on firm performance, most of the evidence that we have seen in the literature is either anecdotal or based on case studies. There is neither much large-scale empirical proof of this impact nor systematic analysis and documentation of its magnitude. Furthermore, the supply chain management literature has focused more on efficiency improvement and cost reduction in supply chain operations and less on the phenomenon of strategic consistencies between the characteristics of a product and its underlying supply chain; i.e., s*upply chain fit*.

The concept of supply chain fit has been popularized by Fisher's (1997) conceptual supply chain–product match/mismatch framework and has its roots in the manufacturing and operations strategy literature. Forty years ago, Skinner (1969) called for a more integrated view of a firm's strategy and its manufacturing function. Over the years the research on competitive priorities in operations management, configurations of operations and manufacturing strategy, the successful alignment of product characteristics and competitive strategy with a firm's operations strategy, and performance implication thereof has grown considerably (e.g., Boyer et al., 2000; Hayes and Pisano, 1996; Joshi et al., 2003; Ward et al., 1996). The extension of this research in the supply chain management literature just began to emerge (e.g., Qi et al., 2009; Qi et al., 2011).

In this article we augment this research in three important ways. First, we further extend the operations and manufacturing strategy perspective towards the more recent supply chain thinking (Chen and Paulraj, 2004; Kouvelis et al., 2006). We achieve this by assessing whether the firms' supply chains priorities are in line with its products and business strategies. Second, we conceptualize supply chain fit as "fit as matching" (Venkatraman, 1989). As a consequence, deviation score analysis allows us to go beyond a 1:1 ('all or nothing') association between product characteristics and supply chain design. Furthermore, we can distinguish between positive and negative misfit. Third, we assess supply chain management's bottom-line financial impact and the magnitude of this impact by measuring performance with objective financial metrics from secondary data (Boyer and Swink, 2008; Roth, 2007).

From a managerial perspective, achieving supply chain fit is challenging[1] and supply chain misfits may be consequential. For example, Hensley and Knupfer (2005) estimate that the cost of supply chain misfit among carmakers and parts suppliers in the U.S. automotive industry is in excess of USD 10 billion each year. Hence, guidelines that help firms understand how to achieve supply chain fit would be valuable. By developing an understanding of the impact of supply chain fit on performance, firms will be well on their way to build such guidelines and their own models for supply chain excellence. By using a financial performance measure (i.e., Return on Assets, ROA) as an outcome of supply chain fit (or misfit) – as we do in this research – we speak in the language of managers who are more familiar with such measures than with subjective, perceptual performance measures. Relating supply chain fit to ROA will result in a higher impact of our research in corporate practice.

The rest of the paper is organized as follows. In Section 2, we begin by providing the theoretical and conceptual background from the operations strategy literature in support of our hypothesis. We then present our study's methodology, introduce the measures used in our study, and describe the sample in Section 3. Section 4 assesses the reliability and validity of our measures, followed by regression analyses in Section 5, and two post-hoc analyses in Section 6. In Section 7 we discuss our results and provide theoretical and managerial implications. Finally, we conclude in Section 8 with limitations and suggestions for future research.

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[1] In addition to the evidence in the literature (e.g., Chopra and Meindl, 2010; Fisher, 1997; Lee, 2002), our survey respondents, supply chain executives and board members from leading manufacturing firms around the globe, also emphasize this fact:

- "The integrated oil & gas supply chain shows two characteristics. Upstream is driven by flexibility, downstream by efficiency and flexibility. We face big problems as a leading oil company to find the optimal fit."
- "We have worked with our customers to align production and sales demand. We have also extended this to our critical suppliers to gain cost reductions, however we are still far away from a high degree of fit."
- "We have increased our supply chain awareness as an integrated approach, being more than the sum of individual activities, but supply chain excellence in terms of matching products and supply chain design is challenging."

2. Background and hypothesis

The operations strategy literature is an important starting point for this study's main argument that an alignment of product and supply chain priorities will be positively related to performance. Therefore, we briefly discuss the operations management/strategy literature which is relevant for our study.

2.1. Competitive priorities of the supply chain

A fundamental element of operations strategy is the definition of the firm's competitive priorities. These may include the basic priorities cost, quality, delivery, and flexibility (Boyer and Lewis, 2002; Ward et al., 1998), as well as additional ones such as innovation (Hayes and Pisano, 1996; Krause et al., 2001; Kroes and Ghosh, 2010). A firm has to make trade-offs between these priorities while allocating its limited resources (Skinner, 1969), at least with respect to the relative rates of improvement of the different priorities (Hayes and Pisano, 1996). In their study of 110 manufacturing plants Boyer and Lewis (2002) found that trade-offs between cost and flexibility, delivery and flexibility, and delivery and quality exist. This trade-off is also reflected in the distinction between lean vs. agile manufacturing (e.g., Inman et al., 2011; Narasimhan et al., 2006) and supply chain strategies (Qi et al., 2009; Qi et al., 2011), as well as the efficiency–responsiveness dichotomy in supply chain priorities, where efficient supply chains aim for the cost-efficient fulfillment of predictable demand, and responsive supply chains for the quick response to unpredictable demand (Fisher, 1997; Parmigiani et al., 2011; Randall et al., 2003) (Table 1).

Insert Table 1 about here

2.2. Product characteristics

There is a common understanding that the nature of products and product demand are related to operational processes and supply chains (Skinner, 1969; Utterback and Abernathy, 1975). Hayes and Wheelwright (1979) proposed a product–process matrix suggesting a link between a firm's products and its process life-cycle stages. Based on the product–process matrix, Hayes and Wheelwright (1979, p. 134) argued that process choice should support the firm's products and conclude that "a certain kind of product structure is matched with its 'natural' process structure. On one end, firms with highly standardized, high volume commodity products should rely on efficient continuous flow shop processes; on the other end, firms unstandardized, low volume customer-specific products should rely on flexible job shop processes. The concept that a match between product structures and manufacturing process structures is related to performance found also empirical support (e.g., Miller and Roth, 1994; Safizadeh et al., 1996).

From a supply chain perspective and based on characteristics such as product life-cycle, margin, product variety, forecasting error, stock-out rate, markdown or distribution intensity, products can be characterized as being either certain/predictable (also called 'functional') or uncertain/unpredictable (also called 'innovative') (Table 2) (Fisher, 1997; Qi et al., 2009; Selldin and Olhager, 2007).

Insert Table 2 about here

2.3. Supply chain fit

In general, firms are expected to achieve better performance with environmental and internal consistency, or *fit*, among strategic, structural, and contextual variables (Alexander and Randolph, 1985; Burton et al., 2002; Gresov, 1989; He and Wong, 2004). In the operations management literature, there is also a long history of studying internal fit, environmental fit, and equifinality (Boyer et al., 2000; Bozarth and McDermott, 1998). For example, Skinner (1969) advocated the alignment of a firm's strategy with its manufacturing function. The product–process matrix research argues that a firm's processes must match the characteristics of its products (Hayes and Wheelwright, 1979). Ward et al. (1996, p. 602) observed that "manufacturing strategy, competitive strategy, environment, and structure are configured or interlinked such that there are natural congruences between these elements” and hypothesize “that business units which conform to one of the configurations will be more likely to perform well than those which are not aligned.” (Ward et al., 1996, p. 623)

Extending the concept of fit to the supply chain strategy context, we conceptualize supply chain fit based on the framework of Fisher (1997) who formalizes fit by characterizing products as being either certain/predictable or uncertain/unpredictable (Table 2), and supply chains as being either efficient or responsive (Table 1). In our research, supply chain fit is defined as the perfect strategic consistency between a product’s supply and demand characteristics (such as demand predictability, life-cycle length, product variety, service, lead-times, and specific market requirements) and supply chain design characteristics (such as inventory strategy, product design strategy, and supplier selection aspects). For certain/predictable [uncertain/unpredictable] products the perfect strategic consistency is achieved with an efficient [responsive] supply chain (Chopra and Meindl, 2010; Fisher, 1997; Lee, 2002) (Figure 1).

Insert Figure 1about here

In summary, based on the arguments that firms’ competitive priorities and processes must support and match its product structures and characteristics (Hayes and Wheelwright, 1979; Ward et al., 1996), and the above discussion that firms achieving a high degree of supply chain fit excel firms with a low degree of supply chain fit through higher supply chain and financial performance (Fisher, 1997; Chopra and Meindl, 2010), we hypothesize the following:

Hypothesis: Supply chain fit is positively associated with financial performance of the firm.

3. Methodology

3.1. Questionnaire design and data collection

To test our hypothesis, we drafted a questionnaire in English and pretested it with executives and managers who were asked to review the questionnaire for readability, ambiguity, and completeness (Dillman, 2007). The questionnaire was also critiqued by several academics who were asked to review survey items (statements) for ambiguity and clarity, and to evaluate whether individual items appeared to be appropriate measures of their respective constructs (DeVellis, 2003). Minor changes were made based on these pretests. The English questionnaire was then translated into German and French by two native speakers and translated back into English by two other individuals to ensure similarity of meaning and semantic equivalence across the countries (Schaffer and Riordan, 2003).

From September 2007 to April 2008 we collected data from managers of manufacturing firms in the USA, the UK, Germany, Austria, Switzerland, and France. More specifically, we contacted 1,834 supply chain, logistics, and purchasing executives at the 1,000 largest manufacturing firms in these countries. Following Dillman's Total Design Method (Dillman, 2007), initial mailings were followed by second mailings and follow-up phone calls if necessary, resulting in 400 responses (21.8%). Out of our sample, we obtained secondary data for 259 firms, yielding an effective response rate of 14.1% (259/1,834).

3.2. Measures

The constructs of interest in this study were measured either using objective secondary data from Bloomberg or multiple items from the questionnaire survey. For the latter multi-item scales, respondents had to indicate the extent to which they agreed or disagreed with the statement on a five-point scale (1–low, 5–high) with higher scores reflecting increases in underlying constructs. The items used to measure each scale were adapted based on existing scales from the literature. Translations of the individual scale items, response cues for each measure, and descriptive statistics are detailed in Table 3.

Insert Table 3 about here

Supply chain fit. Supply chain fit requires a match between the two dimensions of supply and demand uncertainty of a product and supply chain design characteristics. The respondents had to answer the items for these two dimensions with respect to their firms' main product line, which was defined as the current sales (revenue) driver of the firm, i.e. the product line with the largest contribution to sales/revenues. This is also our unit of analysis.

The measure of *supply and demand uncertainty (SDU)* is rooted in the conceptualization of the product structures in the product–process matrix (Hayes and Wheelwright, 1979), the measures used for its empirical tests (Safizadeh et al., 1996), and in particular the conceptualization used by Fisher (1997) and subsequent empirical applications of Fisher's work (Qi et al., 2009; Selldin and Olhager, 2007). We transformed five SDU measures that capture the uncertainty aspects of the product into a five-point Likert scale where the specific numerical targets appear at the respective endpoints of the five-point scale. The product life-cycle (SDU1) is the length of time between the introduction of the product to the market and its removal from the market. For firms it is often necessary to stretch the product line into a "product family" of a significant number of variants (SDU2) with respect to changing customer requirements and market segmentation. The average forecast error (SDU3) of the main product line is defined as the deviation between the forecasted quantity (units) and the actual quantity needed at the time production is committed: Forecast Error = Absolute value of (Actual quantity – Forecasted quantity). Next, sales locations (SDU4) are trading platforms in which goods and/or services reach customers and potential customers. It is assumed that the higher the number of sales locations, the better the firm's ability to provide widespread and/or intensive sales (and distribution) coverage. Changes in order content (SDU5) take place if the order is changed in terms of content, size, delivery time, or other patterns.

The *supply chain responsiveness (SCR)* measure which is theoretically grounded in the empirical work on competitive priorities in operations management (Ward et al., 1998; Boyer and Lewis, 2002) and was applied in a supply chain context (Fisher, 1997; Lo and Power, 2010; Selldin and Olhager, 2007) captures the strategic priorities of the firms' supply chain strategy. Respondents were asked to assess five SCR measures with regard to the needs of the main product (line) on a five-point scale: delivery reliability (SCR1), buffer inventory of parts or finished goods (SCR2), buffer capacity in manufacturing (SCR3), quick response to unpredictable demand (SCR4), and frequency of new product introductions (SCR5).

Since our fit concept is “a theoretically defined match between two related variables” (Venkatraman, 1989, p. 430), namely SDU and SCR, we operationalize fit within a matching perspective. This method has previously been employed in empirical studies of fit in the management (e.g., He and Wong, 2004) and operations management (e.g., Stock and Tatikonda, 2008) literature. Following the perspective of “fit as matching” (Venkatraman, 1989), we calculate *supply chain fit* (SCF) for firm i as as $SCF_i = |SDU_i – SCR_i|$. The deviation score captures the *degree* of misfit on a continuum between a total misfit and a perfect fit, where lower values indicate greater fit. When $SCF_i = 0$, perfect supply chain fit is achieved.

Financial performance of the firm. The financial ratio Return on Assets (*ROA*) was used to tap the financial performance of the firm. ROA as the net income divided by total assets shows how effectively a firm utilizes its assets in generating profits. This secondary data was obtained from Bloomberg.

Control variables. To eliminate undesirable sources of variance, we included control variables which may influence and confound the relationships of the key variable in our model. First, we eliminated *country effects* (e.g., Bozarth et al., 2009; Huang et al., 2008). Economic, political, and cultural differences influence the strategic and operational possibilities of firms and therefore might influence profitability. Following the procedure suggested by Cohen et al. (2003, pp. 303-307), responses from the UK were coded as the variable “Country UK,” responses from France were coded as the variable “Country France,” and responses from German-speaking countries were coded as the variable “Country Germany.” Finally, responses from the USA were used as the baseline.

Second, *firm age* is an important structural variable. In general, firm age might be related to firm performance, and in particular, firm age might influence the status of implementation of supply chain management practices (e.g., Amburgey et al., 1993; White et al., 1999). As such, we followed the recommendation to control for firm age (e.g., Park and Ro, 2011; Terjesen et al., 2011) and calculated firm age as the number of years since firm foundation (logarithmized).

Third and similar, *firm size* might be related to firm performance. Larger firms might have more market penetration power than smaller firms and thus might be more profitable. Smaller firms, in contrast, might be more innovative, and therefore more profitable. Smaller firms might have fewer financial and managerial resources than larger firms for the implementation of supply chain management practices (e.g., Cao and Zhang, 2011; Prater and Ghosh, 2006). In sum, in order to eliminate these potential confounds, we followed the recommendation to control for firm size (e.g., Ettlie, 1998; Park and Ro, 2011; Terjesen et al., 2011). Firm size is measured as the number of employees (logarithmized).

Fourth, *competitive intensity*, the extent to which a firm perceives its competition to be intense and the extent to which it competes to retain its market share, is another important structural variable with potential impact on financial performance (e.g., Barnett, 1997; Jermias, 2008). It was captured by four items asking respondents for the amount of rivalry among firms in the industry. We employed the scale used by Jaworski and Kohli (1993).

Fifth, since there are likely *industry effects* with respect to supply chain priorities and practices (e.g., Bozarth et al., 2009; Miller and Roth, 1994) which are beyond the scope of our current study, we control for industry as recommended in previous studies (e.g., Huang et al., 2008; Rungtusanatham et al., 2005). We again followed the procedure suggested by Cohen et al. (2003, pp. 303-307), dummy-coded all industries and used the industry "aerospace & defense" as the baseline.

Sixth, since financial performance can be greatly influenced by previous financial performance, it is vital control for this so called "*halo effect*" (Brown and Perry, 1994; Rosenzweig, 2007). To do so, we included the prior three years' financial performance (i.e. ROA_{t-1}, ROA_{t-2} and ROA_{t-3}) as controls in our regression model (e.g., Shah and Shin, 2007).

3.3. Sample

Table 4 provides a detailed breakdown of the sample and respondents. Approximately 61.39% of respondents are C-level executives, vice presidents, directors, or department heads, mainly in supply chain management (40.93%), logistics (18.53%), production and procurement (16.99%), general management (10.42%), and closely related logistics fields (13.13%). These respondents are likely to possess an overarching, boundary-spanning view of their firms' upstream and downstream activities pertaining to their firms' main product lines. The average respondent has worked in procurement, logistics, supply chain, production, or another related field for 13.2 years, has been in his/her position for 3.9 years, and has been with the firm for 9.9 years, yielding a very good knowledge of the underlying main product line, the supply chain structure, and supplier and customer base of his/her firm.

Insert Table 4 about here

The firms' annual sales range from USD 18.1 million to USD 219.9 billion (mean = USD 19.75 billion), and the number of employees ranges from less than 100 to 398,200 (mean = 52,031). In terms of annual sales and retained employees, the sample is thus heterogeneous. The range and size of the included firms and the diversity of industries represented suggest that any systematic bias can be excluded.

3.4. Non-response bias

To verify that our results are not subject to non-response bias, we applied two techniques (Wagner and Kemmerling, 2010). First, we organized the data set into two groups of equal size, one group with the earlier respondents and one group with the later respondents. To assess whether there are statistically significant differences between these two groups, we performed *t*-tests on the respective responses of the two groups. The *t*-tests ($p < .05$) yielded no statistically significant mean differences among all items used in the estimated models. In addition, we tested for differences between firm size and industry clusters. Again, no significant statistical differences were found. Second, we contacted a sample of non-respondents by phone and asked them to complete the survey. Responses from 52 non-respondents were compared to the data of respondents; *t*-test results did not show statistical differences. Based on these analyses, we concluded that non-response bias does not pose a problem in our study.

4. Reliability and validity

Before testing our core hypothesis, we first assessed the reliability and validity of the reflective constructs and the underlying items. The independent variable supply chain fit builds on two reflective constructs (supply and demand uncertainty and supply chain responsiveness). We assessed the reliability and validity of these reflective constructs using confirmatory factor analysis (CFA) (Bagozzi et al., 1991). Hereby *supply and demand uncertainty*, *supply chain responsiveness*, and the control variable *competitive intensity* were included into a CFA model estimated with Amos 16.0 using the maximum likelihood estimation method.

The CFA results depicted in Table 5 indicate acceptable psychometric properties for all constructs. Composite reliabilities and average variances extracted for all constructs reach the common cut-off values of 0.70 (Nunnally and Bernstein, 1994) and 0.50 (Bagozzi and Yi, 1988; Fornell and Larcker, 1981), indicating construct validity. Without exception, each item loaded on its hypothesized construct with large loadings, significant at the 99% confidence interval, which represents a high level of item validity. This high level of item reliability implies that the items are strongly influenced by the construct they measure and indicates that sets of items used to capture the construct are unidimensional. The CFA indicated an acceptable fit (χ^2/df = 1.998; GFI = 0.922; RMSEA = 0.062; SRMR = 0.053) (Hair et al., 2010; Steiger, 2007).

Insert Table 5 about here

The estimates of the CFA model also allow us to assess convergent and discriminant validity. Inter-construct correlations and squared correlations are provided in Table 6. All the results are within acceptable ranges, indicating convergent and discriminant validity of our reflective constructs as measured by their items (Fornell and Larcker, 1981).

As the dependent variable is based on objective secondary data, the concern regarding common method bias can be discarded (Craighead et al., 2011).

Insert Table 6 about here
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5. Analysis and results

We scrutinized the hypothesis with a series of regression models. All models were estimated using ordinary least squares (OLS) estimation in the R system for statistical computing version 2.13.0 (R Development Core Team, 2010). The critical assumptions underlying OLS regression analysis were checked; i.e., (1) the residuals are normally distributed; (2) the residuals are of constant variance (homoscedasticity) over sets of values of the independent construct; and (3) multicollinearity of the independent construct is within an acceptable range (Cohen et al., 2003). To this end, the regression model was subjected to a visual residual analysis using normal Q-Q plots. No obvious outliers were detected and residuals appeared to be approximately normally distributed. Homoscedasticity was checked using the Breusch-Pagan test (p > 0.05), which did not indicate a serious problem with heteroscedasticity. The bivariate correlations between the independent variables as well as variance inflation factors (VIF) were within acceptable ranges, indicating that multicollinearity did not pose a serious problem to the regression analysis. In summary, the conducted tests provided no grounds to assume the inappropriateness of the chosen method. Nevertheless, to correct for possible heteroskedasticity and obtain correct standard error estimates, we used the Huber-White correction (Huber, 1967; White, 1980) implemented in the package sandwich in R (Zeileis, 2004).

The performance variable ROA was first regressed on the control variables (Model 1) and then the independent variable SCF was entered (Model 2). Table 7 reports the regression results including the increments to adjusted R^2 and the significance of the regression equations. The baseline regression models with all 259 firms included show that misfit has a negative impact on performance (β = -1.268, p < 0.001), providing support for our hypothesis that supply chain fit is positively associated with performance. The average ROA for the 259 firms was 6.49%.

Insert Table 7 about here
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6. Post-hoc analysis

6.1. Negative and positive misfit

To derive additional insights, we conducted post-hoc analyses in order to be able to differentiate between groups of firms with supply chain fit, with negative misfit and with positive misfit.[2] First, we plotted the supply and demand uncertainty (SDU) scores and supply chain responsiveness (SCR) scores of all firms in order to visualize the distribution of the firms along the two dimensions that determine supply chain fit (Figure 2). Second, we calculated the average ROA and calculated separate regression models when possible given the size of the groups.

Insert Figure 2 about here

Consistent with our previous discussion, we define firms with supply chain fit as firms where the products' supply and demand uncertainty and supply chain responsiveness perfectly match (position on the diagonal in Figure 1). Nine firms in total are firms with supply chain fit, and their average ROA is 10.57%.

Firms with *negative misfit* are defined as firms that designed their supply chains to support responsiveness while the products' supply and demand is quite certain and the products are predictable (position above the diagonal in Figure 1). From the 259 firms in our sample, 180 firms do achieve a negative misfit and their average ROA is 5.80%. The regression results depicted in Table 7 for the 180 firms with negative misfit show that this type of misfit has a stronger negative impact on performance (β = -1.640, $p < 0.001$) compared to misfit in general (as shown in the baseline regression model with all 259 firms where β = -1.268, $p < 0.001$).

In contrast, firms with *positive misfit* are defined as firms that designed their supply chains to support efficiency while the products' supply and demand is rather uncertain and the products are unpredictable (positions below the diagonal in Figure 1). From the 259 firms in our sample, 70 firms do achieve a positive misfit and their average ROA is 7.73%.

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[2] We thank the anonymous associate editor and a reviewer for the comment that positive and negative misfit might have different performance implications which instigated the development of this section.

While the baseline regression model with all firms included shows that misfit has a negative impact on financial performance; firms with zero misfit show the highest financial performance (10.57%), firms with a negative misfit are worse in terms of financial performance (5.80%) as compared to firms with positive misfit (7.73%).

To assess the robustness of our findings, the firms were grouped as follows: Firms with a misfit within one standard deviation (SD) from the perfect fit were compared to firms with negative misfit beyond one SD and positive misfit beyond one SD. This definition follows the idea of the "zone of strategic fit" (Chopra and Meindl, 2010). The results summarized in the Appendix are largely consistent with the findings above: Misfit significantly reduces performance (β = -2.001 with $p < 0.05$ for the 138 firms with fit within one SD), and the average ROA of the 109 firms with negative misfit beyond one SD (5.58%) is lower than the average ROA of the 12 firms with positive misfit beyond 1 SD (7.41%).

6.2. Industry differences

Given the discussion in this paper on the product–process matrix (e.g., Hayes and Wheelwright, 1979; Safizadeh et al., 1996) and the link between certain, predictable, or 'functional' products and efficient supply chains, and uncertain, unpredictable, or 'innovative' products and responsive supply chains (e.g., Chopra and Meindl, 2010; Fisher, 1997; Qi et al., 2009), this research started out with the premise that different types of products need to be treated differently in terms of processes to produce the products. To shed further light into the relationship between product characteristics and supply chain priorities, we conducted another post-hoc analysis with the goal to answer the questions: Does the supply chain–product match/mismatch framework make sense? Do we find support in the real world beyond the conceptual, anecdotal and case study-based insights (e.g., Chopra and Meindl, 2010; Fisher, 1997; Wong, et al., 2006)?

We selected firms in two industries to exemplify how the primary product types which they have to handle are related to the supply chain priorities and analyzed the firms in the food & beverages industry and the textiles & apparel industry. The primary reason for selecting these industries was that we could expect that the products of food & beverage firms are more on the 'functional' side, and products of textile & apparel firms are more on the 'innovative' side of the supply and demand uncertainty spectrum (Lee, 2002). In addition, our sample contained at least more than ten firms in each of these industries. Figure 3 depicts the plot of the supply and demand uncertainty (SDU) and supply chain responsiveness (SCR) scores of the firms in these two industries.

Insert Figure 3 about here

Textiles & apparel industry. The problem of uncertainty in matching product supply with customer demand is particularly pervasive in the apparel industry due to ever more frequently requested product changes and introductions, unprecedented levels of product variety, weather-dependency and seasonality, necessary markdowns, and write-offs on excess inventory (Fisher et al., 1994). Compared to other industries, time delays between supply chain links have been reported to be very high in the apparel industry (between 1 year and 66 weeks) (Blackburn, 1991). These delays are a major reason for the bullwhip effect and also increase unpredictability and therefore uncertainty in demand (Metters, 1997).

To cope with the challenges of unpredictability and uncertainty, firms in the textiles & apparel industry have increasingly upgraded their supply chain strategies and practices to reduce the time required to respond to the market (e.g., postponement, quick response), virtually integrated flexible subcontractors, faster introduced new products, improved the coordination between firms (e.g., information technology links between manufacturers and distributors), and strived for continuous improvement of product and process quality (Fisher and Raman, 1996; Fisher et al., 1997; MacCarthy and Jayarathne, 2010; Tatsiopoulos et al., 2002).

The 12 firms in our sample from this industry demonstrate to follow this pattern. With an average SDU of 3.90, the firms' main product lines are positioned on the higher end of the SDU-spectrum, (i.e., they hold the characteristics of 'innovative' products). As theory suggests, higher SDU should go along with higher SCR. This is also the case with an average SCR of 4.20 for this industry. These firms from the textiles & apparel industry have done their supply chain management homework rather well, with a negative misfit of only -0.30 as an industry average.

Food & beverages industry. In contrary to the textiles & apparel industry, the products that supply chains in the food & beverages industry have to handle are easier to predict. Product life-cycles are longer and stock-out rates and product variety are lower. In the food processing industry, Van Wezel et al. (2006, p. 290) observe, that "[f]or the most part, customer orders can be predicted with high certainty."

The supply chain management of firms in the food & beverages industry has different priorities. Supply chain responsiveness has to match the requirements of the more predictable, functional products. Flexibility, i.e. supply chain responsiveness, in the food processing industry is limited due to the production processes, organizational procedures, and rigid planning processes (Van Wezel et al., 2006), indicating that supply chain responsiveness is more on the low end. The primary focus of continuous replenishment (CR) processes and inter-organizational systems in grocery/food supply chains is to "dramatically reduce inventory levels and costs across the entire value chain" (Clark and Hammond, 1997, p. 249). For example, for Campbell Soup, a producer of canned soups and related products, the goal of implementing CR programs and vendor managed inventories (VMI) in the supply chain was to increase average fill rates, to lower inventories, and to reduce cost of goods sold (Cachon and Fisher, 1997). Likewise, in process industries – including food and beverages – a key production planning task is to match supply and demand "in the most cost-effective manner." (Rajaram and Karmarkar, 2002, p. 680). In sum, the primary competitive priority of the supply chains in this industry is on efficiency enhancement leading to lower costs and lower inventories.

In the food & beverages industry, the 19 firms in our sample also largely follow this pattern. With an average SDU of 2.34, the firms' main product lines are positioned on the lower end of the SDU-spectrum (i.e., hold the characteristics of 'functional' products). With an average SCR of 3.41, their supply chain priorities focus more on efficiency than the firms in the textiles & apparel industry. However, with a negative misfit of -1.07 as an industry average, the supply chains of the firms from the textiles & apparel industry do not match the product characteristics as well.

Summarizing this post-hoc analysis, we can see that these two industries are very good exemplars of the expected product categorizations as proposed in the supply chain–product match/mismatch framework.

However, the firms in our sample from the textiles & apparel industry have done a better job of adjusting their supply chains to their products than the firms from the food & beverages industry. The latter have a greater improvement potential by making their supply chains somewhat more efficient.

7. Discussion and implications

The purpose of this study was to investigate and quantify the impact of supply chain fit on the financial performance of the firm. To achieve supply chain fit, firms must consider three basic steps (Chopra and Meindl, 2010; Lee, 2002): First, they need to understand demand and supply uncertainty of their products and associated customer needs. Second, they need to understand the characteristics and capabilities of their supply chain, that is, the position along the efficiency–responsiveness continuum. Third, they need to ensure that the degree of supply chain responsiveness (supply chain design characteristics and capabilities) is consistent with the products' supply and demand uncertainty. With such a match, "[t]he goal is to target high responsiveness for a supply chain facing high implied uncertainty, and efficiency for a supply chain facing low implied uncertainty." (Chopra and Meindl, 2010, p. 45)

With a multi-country, multi-industry survey sample of 259 manufacturing firms from the USA and Western Europe and secondary financial data, our research is – to the best of our knowledge – the first to empirically validate the positive impact of (or the lack of) supply chain fit on the financial performance of the firm.

7.1. Contributions to the literature

This research makes several noteworthy contributions to the existing literature. First, it tests Fisher's (1997) conceptual supply chain fit model and relates the basic tenet of the model – namely that a match between the supply and demand uncertainty (SDU) of the products and supply chain responsiveness (SCR) is admirable – to a financial performance measure of the firm. While several prior studies have borrowed some elements of Fisher's (1997) supply chain–product match/mismatch framework, they have either investigated the antecedents or consequences of efficient vs. responsive supply chains instead of both dimensions of the framework (Randall et al., 2003), not established a link of the match/mismatch to performance at all (e.g., Aitken et al., 2003; Holmström et al., 2006), or used operational performance outcomes, such as inventory, time, order fulfillment, quality, customer focus, or customer satisfaction (e.g., Ramdas, 2003).

Second, since “supply chain research is in many ways an outgrowth of operations strategy research” (Boyer and Pagell, 2000, p. 370), we built our study on an established foundation and extended the operations and manufacturing towards a supply chain strategy research. As such, we augment some recently published empirical work on supply chain strategy (Qi et al., 2009; Qi et al., 2011).

Third, by employing multivariate analysis techniques to test the core hypothesis and further deriving groups of firms with supply chain fit, with negative misfit and with positive misfit we developed replicable taxonomies of configurations (Miller, 1996). Since this taxonomy is firmly grounded in the operations management literature on the product–process matrix (Hayes and Wheelwright, 1979; Safizadeh et al., 1996) and competitive priorities (Ward et al., 1998; Boyer and Lewis, 2002), as well as Fisher’s (1997) practically relevant supply chain–product match/mismatch framework, it overcomes the critique of some taxonomies that they lack theoretical significance, are arbitrary and narrow, or unreliable and unstable (Ketchen et al., 1993; Miller, 1996).

Fourth, we found that the better the supply chain fit, the higher the Return on Assets (ROA) of the firm. We defined supply chain fit within a matching perspective and employed a deviation score analysis (Venkatraman, 1989). While this method has previously been employed in empirical studies of fit in management (e.g., He and Wong, 2004) and operations management (e.g., Stock and Tatikonda, 2008), our research is the first study based on Fisher’s (1997) framework to go beyond a four-cell typology respectively a 1:1 matching of product characteristics and supply chain strategies or designs (Lee, 2002; Lo and Power, 2010; Parmigiani et al., 2011; Selldin and Olhager, 2007; Wong et al., 2006). In contrary, it measures the *degree* of fit respectively misfit and generates more realistic and practically relevant insights.

Fifth, concerning the deviation from the “perfect fit,” we differentiate between negative misfit and positive misfit, and show that firms with a negative misfit have a lower financial performance (ROA = 5.80%) than firms with a positive misfit (ROA = 7.73%). As such, while our results confirm that "[d]eviations in either direction reduce effectiveness" (Venkatraman, 1989, p. 431), we also show that the result of the deviation is contingent upon the direction of the deviation score.

Sixth, we provide empirical validity for the existing theoretical models that focus on understanding how alternative supply chain management strategies impact performance metrics such as capital and operating costs, service, and inventory levels (e.g., Aviv, 2001; Erhun et al., 2008; Taylor, 2002). By relating the firms' degree of supply chain fit to their Return on Assets (ROA) we contribute to the growing stream of research that investigates the relationship of supply chain management practices and subjective (e.g., Cao and Zhang, 2011; Flynn et al., 2010; Vickery et al., 2003) or objective (e.g., Dehning et al., 2007; Lanier et al., 2010; Mitra and Singhal, 2008) financial performance metrics.

Finally, we make two methodological contributions that will help to advance supply chain management research in the future. By combining multiple methods with data collected through a questionnaire survey in multiple countries and multiple industries with secondary financial data from an independent source (Boyer and Swink, 2008) we help to overcome the frequent criticism of common method bias (Craighead et al., 2011). Furthermore, we built the proposed construct items for supply and demand uncertainty (SDU) and supply chain responsiveness (SCR) on the operations strategy literature which led to more reliable and valid constructs (Boyer and Pagell, 2000).

7.2. Managerial implications

Corporate practice can benefit from the results of our research. First, supply chain fit, that is, the match between the products' supply and demand uncertainty and supply chain responsiveness, is significantly related to the financial performance of the firm. Since only a small number of firms in our sample achieve a perfect fit between these two dimensions, most firms have the potential to initiate the alignment of their supply chains with their products. To do so, firms need to understand the supply and demand characteristics of the products they offer, the characteristics and capabilities of their supply chains, and ensure that the degree of supply chain responsiveness is consistent with the products' supply and demand uncertainty (Chopra and Meindl, 2010). The product characteristics and supply chain designs summarized in Tables 1 and 2 can be a starting point for such an initiative.

Second, while unquestionable firms should strive to design their supply chains to ideally match their products' supply and demand uncertainty, they should also take into account that negative misfit is less desirable than positive misfit. Instead of overinvesting into measures to increase the responsiveness of the supply chain (e.g., through postponement), they should rather invest into measures to increase the efficiency of the supply chain (e.g., through inventory reductions). The resulting positive misfit will be related to higher ROA than a potential negative misfit.

Third, Scott Davis (2005, p. 18), former CFO and now Chairman and CEO of UPS remarked that "aligning supply chain strategy to business strategy continues to be a slow process that often misses the mark. Part of the problem lies with supply chain professionals who need to put themselves in their CFO's shoes and ask themselves, how can I speak the CFO's language?" Our study provides good arguments for supply chain and operations managers that supply chain management is not confined to operational issues (such as lead time reduction, capacity utilization etc.), but that it has tangible, bottom-line financial implications and therefore has a strategic role to play. Therefore, our study will help managers to underline the strategic relevance of supply chain management in the firm.

8. Limitations and future research directions

In our effort to investigate the financial impact of supply chain fit, we encountered several limitations that are common in survey-based research. First, due to the difficulty of generating a sufficiently large sample, we used the same data to purify and validate our measures and then to test the hypothesis. This is a common compromise adopted by many researchers (e.g., Cao and Zhang, 2011; Vickery et al., 2003). Second, we did not survey multiple key informants per firm (i.e., to establish inter-rater reliability) (Wagner et al., 2010). Given the background of the respondents and the usage of objective secondary data, we believe that this is not problematic.

Third, for cross-cultural/cross-national research, measurement equivalence is a critical methodological concern (Malhotra and Sharma, 2008; Rungtusanatham et al., 2005). As our UK sample is too small, we could not conduct a measurement equivalence assessment using either a multi-country CFA or using the generalizability theory approach (therefore, we controlled for country effects). Dealing with measurement equivalence in this manner would be a strong way to address the issue for future research. Fourth, as this research is cross-sectional, it cannot establish causality between variables. Only a longitudinal research design could confirm causality or evolutions of key variables over time, which would further allow investigating the dynamic nature of supply chains towards achieving a fit along the product lifecycle. Fifth, while low coefficients of determination (R^2) are not uncommon in the literature (e.g., Lanier et al., 2010; Singer et al., 2008) the low R^2 values indicate that partial models were investigated. Obviously, various other factors hold predictive power for the investigated dependent variable that were omitted in our conceptual framework, such as sales and marketing efforts, the political and economical situation, as well as brand image and customer loyalty. Also, the firms' main product lines do not represent 100% of the firms' sales. This fact must be taken into consideration while interpreting the results. Finally, in a cross-sectional study such as ours, supply chain fit is difficult to measure due to its normative overtones. Thus, our supply chain fit measure serves as an acceptable approximation, but it is only a proxy and cannot measure the exact current amount of supply chain fit that a firm achieves due to consistencies between its supply chain design and the underlying product. It would be desirable to explore fit directly.

These limitations highlight several additional directions for future research. First, it is generally difficult to determine the root cause of a transformational change. As lack of supply chain fit does not appear overnight but evolves over time, there is a constant threat that supply chain fit does not receive sufficient management attention. Managers generally do not get credit for preventing potential misfits, especially since the potential consequences are not known in advance. Therefore, it can be estimated that over the course of time firms simply neglect the supply chain design aspects and underestimate both the tangible and intangible benefits of achieving supply chain fit. Thus, longitudinal studies analyzing root causes of supply chain misfits would be beneficial. Secondly, selecting an ideal configuration is a complex balancing act and depends on underlying uncertainties in the system. The more changing and uncertain the environment is, the more loosely coupled the elements of a firm’s supply chain may have to be (Miller, 1993). Note that our research focuses on supply chain design issues in which supply and demand uncertainty is the key challenge. In addition to further investigating additional demand uncertainties (such as volume and mix), it would be useful to understand process (such as yield, machine downtimes, and transportation reliabilities) and supply (such as quality and delivery reliability) uncertainties of the products as well as supply chain responsiveness to be able to better measure fit from a holistic point of view. Thirdly, a set of dimensions and variables for the description of configurations which take all aspects of supply chain management into account must be further elaborated; i.e., better supply chain fit predictors and scales to identify determinants based on specified industry requirements should be developed and continuously updated in order to maintain a high level of supply chain fit. For this reason, a more complete set of factors should be included in future analyses of supply chain fit and performance (Miller, 1986).

While this study contains its own limitations, it is, to the best of our knowledge, the first to establish a relationship between supply chain fit and a firm’s financial success; i.e., the bottom-line impact of supply chain management. At the very least, this pattern of results should stimulate future research for the investigated link.

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Table 1. Generic supply chain priorities (adapted from Fisher, 1997)

	Efficient supply chain	Responsive supply chain
Primary purpose	Supply predictable demand efficiently at the lowest possible cost	Respond quickly to unpredictable demand to minimize stock-outs, obsolete inventory, and forced markdowns
Manufacturing focus	Maintain high average utilization rate	Deploy excess buffer capacity
Inventory strategy	Generate high turns and minimize inventory throughout the chain	Deploy significant stocks of parts or finished goods
Lead-time focus	Shorten lead-time for cost and quality	Invest aggressively to reduce lead-time
Approach to choosing suppliers	Select primarily for cost and quality	Select primarily for speed, flexibility and quality
Product-design strategy	Maximize performance and minimize cost	Use modular design to postpone product differentiation for as long as possible

Table 2. Generic product characteristics (adapted from Fisher, 1997)

	Certain/predictable products (“functional products”)	Uncertain/unpredictable products (“innovative products”)
Product life-cycle	More than 2 years	3 months to 1 year
Contribution margin	5%-20%	20%-60%
Product variety	Low (10-20 variants per category)	High (often millions of variants per category)
Average margin of error in the forecast at the time production is committed	10%	40%-100%
Average stock-out rate	1%-2%	10%-40%
Average forced end-of-season markdown as percentage of full price	0%	10%-25%
Lead-time required for made-to-order products	6 months to 1 year	1 day to 2 weeks

Note. The contribution margin equals price minus variable cost divided by price and is described as a percentage.

Table 3. Measures of multi-item constructs

Constructs and Items	Mean	SD
Supply and Demand Uncertainty (SDU) (based on Fisher, 1997)	**2.45**	**0.83**
Please evaluate the following characteristics for the main product line…		
SDU1* How long is the average lifecycle of the products in the main product line?	1.95	1.27
□ < 6 months ago □ 6 – 12 months ago □ 1 – 2 years ago □ 2 – 5 years ago □ > 5 years ago		
SDU2 How many different variants are available for the main product line?	2.79	1.32
□ < 20 □ 20 – 49 □ 50 – 99 □ 100 – 999 □ > 1000 or more		
SDU3 What is the average margin of error in the forecast based on units at the time production is committed?	2.59	1.01
□ 0% – 9% □ 10% – 19% □ 20% – 39% □ 40% – 59% □ 60% – 100%		
SDU4 What is the number of sales locations for the main product line?	2.39	1.43
□ < 100 □ 100 – 499 □ 500 – 999 □ 1000 – 1499 □ 1500 or more		
SDU5 What is the frequency of change in order content for the main product line?	2.56	0.94
□ extremely low □ low □ medium □ high □ extremely high		
Supply Chain Responsiveness (SCR) (based on Fisher, 1997)	**3.40**	**0.61**
Please indicate the strategic supply chain priorities for the main product line (1: not important at all – 5: extremely important)…		
SCR1 Improve delivery reliability	3.91	0.84
SCR2 Maintain buffer inventory of parts or finished goods	3.34	0.87
SCR3 Retain buffer capacity in manufacturing	3.17	0.92
SCR4 Respond quickly to unpredictable demand	3.56	0.88
SCR5 Increase frequency of new product introductions	3.05	0.86
Competitive Intensity (CI) (based on Jaworski and Kohli, 1993)	**3.48**	**0.75**
Please indicate the competitive intensity of your main product line (1: strongly disagree – 5: strongly agree)...		
CI1 Cutthroat competition	3.73	1.00
CI2 Anything that one competitor can offer, others can match readily	3.03	1.11
CI3 Price competition is a hallmark of your industry	3.28	1.12
CI4* Relatively weak competitors	3.90	0.96

Note. All items were measured on five-point scales. Construct mean is calculated as (arithmetic) mean of all scale scores. SD refers to standard deviation.
* Item scale was reverse-scored.

Table 4. Sample demographics

Industry Sector	N	%
Aerospace & defense	24	9.27
Automotive & parts	29	11.20
Chemicals	16	6.18
Construction & materials	14	5.41
Electricity	4	1.54
Electronic & electrical equipment	28	10.81
Food & beverages	19	7.34
Forestry & paper	5	1.93
Household goods & personal goods	25	9.65
Industrial metals	10	3.86
Machinery & plant engineering	24	9.27
Medical equipment	10	3.86
Mining	4	1.54
Oil & gas	6	2.32
Pharmaceuticals & biotechnology	12	4.63
Technology hardware & equipment	17	6.56
Textiles & apparel	12	4.63
Total	**259**	

Number of Employees	N	%
< 100	3	1.16
100-499	20	7.72
500-999	17	6.56
1,000-4,999	52	20.08
5,000-9,999	40	15.44
> 10,000	127	49.04
Respondent Job Title	**N**	**%**
CxO/Vice President	37	14.29
Director/Department Head	122	47.10
Manager	64	24.71
Team Leader	18	6.95
Others	18	6.95
Respondent Function	**N**	**%**
Supply Chain Management	106	40.93
General Management	27	10.42
Logistics	48	18.53
Purchasing	24	9.27
Production/Manufacturing	20	7.72
Others	34	13.13

Table 5. Evaluation of reflective constructs

Constructs and Items	Cronbach alpha	Total variance explained	Common-alities	Item-to-total correlation	Composite reliability	AVE	Factor loading	t-value	SE	IR
Supply and Demand Unvertainty (SDU)	0.718	0.482			0.860	0.566				
SDU1			0.385	0.424			0.621	-[a]	-[b]	0.457
SDU 2			0.364	0.398			0.603	5.373	0.178	0.395
SDU 3			0.511	0.524			0.715	6.357	0.147	0.667
SDU 4			0.630	0.573			0.794	6.186	0.278	0.628
SDU 5			0.523	0.518			0.723	5.805	0.171	0.748
Supply Chain Responsiveness (SCR)	0.744	0.499			0.874	0.597				
SCR1			0.253	0.329			0.503	-[a]	-[b]	0.269
SCR2			0.521	0.516			0.722	4.862	0.382	0.624
SCR3			0.654	0.622			0.809	5.035	0.475	0.726
SCR4			0.580	0.575			0.762	5.075	0.377	0.647
SCR5			0.487	0.500			0.698	4.841	0.344	0.553
Competitive Intensity (CI)	0.686	0.518			0.810	0.536				
CI1			0.553	0.497			0.847	-[a]	-[b]	0.520
CI2			0.613	0.533			0.931	7.024	0.200	0.598
CI3			0.616	0.541			0.404	6.887	0.219	0.576
CI4			0.289	0.312			0.904	4.709	0.134	0.298

Note. All items were measured on five-point rating scales (Likert-type). SE refers to standard error from the unstandardized solution, AVE refers to average variance extracted, and IR refers to indicator reliability (Fornell and Larcker, 1981).

[a] *t*-values are from the unstandardized solution; all are significant at the 0.001 level (two-tailed).

[b] Factor loading was fixed at 1.0 for identification purposes.

Table 6. Descriptive statistics and variable correlations

Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
(1) Country France	.19	.39		.02	.18	.00	.01	.00	.00	.03	.00	.01	.01	.00	.00	.01	.00	.01	.00	.00	.00	.02	.02	.00	.00	.00	.01	.00	.00
(2) Country UK	.06	.24	-.12*		.05	.00	.02	.01	.00	.00	.01	.00	.00	.01	.00	.01	.00	.01	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00
(3) Country Germany	.43	.50	-.42**	-.22**		.04	.00	.01	.02	.02	.00	.00	.00	.02	.00	.00	.00	.04	.00	.01	.00	.01	.00	.00	.01	.00	.00	.00	.00
(4) Firm age	84.01	54.16	-.04	.02	.20**		.02	.01	.01	.00	.00	.02	.02	.02	.00	.00	.00	.03	.00	.00	.00	.00	.03	.02	.02	.00	.01	.01	.00
(5) Firm size	52,031	88,308	.10	-.14*	.01	.15*		.04	.07	.01	.01	.00	.00	.02	.00	.00	.00	.01	.01	.00	.00	.00	.01	.01	.00	.00	.02	.01	.00
(6) Competitive intensity	3.49	.76	.03	-.10	-.07	.09	.21**		.00	.02	.00	.00	.00	.02	.00	.01	.00	.03	.00	.00	.00	.04	.01	.01	.01	.03	.01	.01	.01
(7) Automotive & parts	.11	.32	.02	.06	.14*	.07	.26**	.05		.01	.01	.00	.02	.01	.00	.01	.01	.01	.01	.00	.00	.01	.01	.01	.00	.01	.02	.01	.01
(8) Chemicals	.06	.24	.16**	-.07	-.13*	.04	-.08	.13*	-.09		.00	.00	.01	.01	.00	.01	.00	.01	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00
(9) Construction & materials	.05	.23	-.03	.08	.03	.03	-.08	.02	-.08	-.06		.00	.01	.00	.00	.01	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00
(10) Electricity	.02	.12	.10	-.03	.02	-.12*	-.02	-.02	-.04	-.03	-.03		.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01	.00	.00	.00
(11) Electronic & electrical equipment	.11	.31	-.10	.01	.05	-.16*	-.06	-.03	-.12*	-.09	-.08	-.04		.01	.00	.01	.00	.01	.00	.00	.00	.01	.01	.01	.00	.02	.00	.00	.01
(12) Food & beverages	.07	.26	.05	-.07	-.12*	.15*	.16*	.15*	-.10	-.07	-.07	-.04	-.10		.00	.01	.00	.01	.00	.00	.00	.00	.01	.00	.01	.01	.00	.00	.00
(13) Forestry & paper	.02	.14	.00	-.04	-.06	-.02	-.07	-.03	-.05	-.04	-.03	-.02	-.05	-.04		.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02	.00	.01	.00
(14) Household goods & personal goods	.10	.30	-.09	.08	.03	.05	-.02	.08	-.12	-.08	-.08	-.04	-.11	-.09	-.05		.00	.01	.00	.00	.00	.01	.01	.01	.01	.00	.00	.01	.01
(15) Industrial & metals	.04	.19	-.05	.03	-.05	.01	-.02	-.05	-.07	-.05	-.05	-.03	-.07	-.06	-.03	-.07		.00	.00	.00	.00	.00	.00	.00	.01	.01	.00	.00	.00
(16) Machinery & plant construction	.09	.29	-.09	.08	.21**	.17**	-.10	-.18**	-.11	-.08	-.08	-.04	-.11	-.09	-.04	-.10	-.06		.00	.00	.00	.00	.01	.00	.00	.00	.00	.02	.01
(17) Medical equipment	.04	.19	.06	-.05	.03	.06	-.09	.05	-.07	-.05	-.05	-.03	-.07	-.06	-.03	-.07	-.04	-.06		.00	.00	.00	.00	.00	.00	.01	.00	.00	.00
(18) Mining	.02	.12	-.06	-.03	.08	.06	-.05	.06	-.04	-.03	-.03	-.02	-.04	-.04	-.02	-.04	-.03	-.04	-.03		.00	.00	.00	.00	.00	.01	.01	.01	.00
(19) Oil & gas	.02	.15	-.01	-.04	-.03	.01	-.03	.01	-.05	-.04	-.04	-.02	-.05	-.04	-.02	-.05	-.03	-.05	-.03	-.02		.00	.00	.00	.03	.05	.04	.01	.04
(20) Pharmaceutical & biotechnology	.05	.21	.13*	.02	-.08	.02	-.03	-.21**	-.08	-.06	-.05	-.03	-.08	-.06	-.03	-.07	-.04	-.07	-.04	-.03	-.03		.00	.00	.00	.01	.01	.01	.01
(21) Technology hardware & equipment	.07	.25	-.13*	-.07	-.04	-.17**	.09	-.11	-.09	-.07	-.06	-.03	-.09	-.07	-.04	-.09	-.05	-.08	-.05	-.03	-.04	-.06		.00	.00	.01	.00	.00	.00
(22) Textiles & apparel	.05	.21	-.06	-.06	.03	-.14*	-.09	.11	-.08	-.06	-.05	-.03	-.08	-.06	-.03	-.07	-.04	-.07	-.04	-.03	-.03	-.05	-.06		.00	.00	.00	.05	.00
(23) ROA 2004	5.41	7.54	-.01	-.08	-.10	-.14*	-.01	-.10	-.05	-.08	.00	-.11	.03	.10	-.10	-.10	.11	-.04	.03	.03	.18**	.05	.05	.05		.57	.38	.00	.38
(24) ROA 2005	5.36	8.09	-.04	-.04	-.02	-.06	-.05	-.16**	-.07	-.06	.01	-.07	-.16*	.09	-.13*	-.06	.08	-.03	.07	.09	.22**	.10	.11	.04	.75**		.53	.00	.52
(25) ROA 2006	6.68	7.56	-.12	.02	.00	-.07	-.13*	-.09	-.14*	-.07	-.01	.02	-.01	.01	-.03	-.07	.06	.07	.07	.11	.19**	.12	-.01	.06	.61**	.73**		.01	.66
(26) Supply Chain Fit	1.06	.62	.04	.00	.07	.09	-.08	-.12	.08	.02	.10	-.02	-.04	.03	-.09	-.10	-.05	.15*	.02	-.09	.07	-.08	-.04	-.21**	-.07	-.05	-.09		.02
(27) ROA 2007	6.49	7.64	-.04	-.06	-.06	-.02	-.06	-.10	-.09	-.03	-.01	-.04	-.10	.07	-.07	-.08	.05	.09	.07	-.02	.20**	.10	-.01	.03	.62**	.72**	.81**	-.13*	

Note. Pearson correlation coefficients are below the diagonal, and squared correlations (shared variance) are above the diagonal.

** Significant at the 0.01 level (two-tailed).

* Significant at the 0.05 level (two-tailed).

Table 7. Average ROA and OLS regression results for different degrees of "fit"

	All firms				Firms with fit	Firms with negative misfit				Firms with positive misfit			
Number of firms	259				9	180				70			
Average ROA	**6.49**				**10.57**	**5.80**				**7.73**			
Independent variables	Model 1		Model 2		[a]	Model 1		Model 2		Model 1		Model 2	
Intercept	-.369	(2.475)	2.299	(2.407)		-.278	(2.779)	3.136	(2.736)	-.103	(5.214)	-.485	(4.808)
Control variables													
Country France	-.373	(.581)	-.283	(.584)		-.960	(.748)	-.834	(.762)	2.047	(1.200)	2.078†	(1.157)
Country UK	-2.963*	(1.288)	-3.198*	(1.274)		-3.859*	(1.676)	-4.404**	(1.667)	.300	(1.733)	.277	(1.691)
Country Germany	-1.451†	(.802)	-1.380†	(.790)		-1.763†	(1.027)	-1.870†	(1.030)	.118	(1.240)	.058	(1.216)
Firm age	1.740†	(.979)	1.702†	(.972)		2.092*	(1.060)	2.157*	(1.082)	-1.902	(2.423)	-2.117	(2.585)
Firm size	-.001	(.267)	-.160	(.260)		.218	(.289)	.014	(.276)	.232	(.680)	.322	(.672)
Competitive intensity	-.136	(.346)	-.228	(.339)		-.542	(.390)	-.696†	(.383)	1.076	(.647)	.963	(.661)
Automotive & parts	-.072	(.892)	-.116	(.878)		-.077	(1.045)	.238	(1.051)	.337	(1.662)	.502	(1.664)
Chemicals	.016	(.829)	-.192	(.855)		.128	(.812)	-.083	(.880)	.599	1.841)	.772	(1.688)
Construction & materials	-.350	(.803)	-.295	(.788)		.257	(1.024)	.468	(1.010)	-1.542	(1.143)	-1.426	(1.332)
Electricity	-1.492	(2.638)	-1.979	(2.457)		-1.450	(2.731)	-2.065	(2.520)				
Electronic & electrical equipment	-1.654	(1.463)	-2.051	(1.472)		-1.632	(1.993)	-1.824	(1.976)	-2.284	(1.789)	-2.275	(1.737)
Food & beverages	-.571	(.686)	-.609	(.668)		-.049	(.772)	-.074	(.770)	-.519	(1.267)	-.509	(1.367)
Forestry & paper	-1.756	(1.519)	-2.607†	(1.577		-3.501	(2.327)	-4.103	(2.522)	1.202	(1.174)	1.677	(1.346)
Household goods & personal goods	-.868	(.820)	-1.383†	(.788)		.205	(1.119)	-.092	(1.036)	-1.172	(1.291)	-.994	(1.339)
Industrial & metals	-1.413	(.958)	-1.814†	(1.084)		-.529	(.948)	-.975	(.979)	-.089	(1.544)	-.172	(1.388)
Machinery & plant construction	1.059	(1.224)	1.108	(1.203)		.880	(1.405)	1.127	(1.375)	3.901†	(2.039)	4.270†	(2.200)
Medical equipment	-.512	(.807)	-.697	(.752)		-.401	(.701)	-.298	(.699)	.661	(2.283)	1.104	(2.398)
Mining	-7.373**	(2.405)	-8.135***	(2.252)		-8.142*	(3.164)	-8.982**	(2.988)	-6.518***	(.980)	-5.879***	(1.136)
Oil & gas	-.196	(1.186)	.048	(1.103)		-.179	(1.285)	-.014	(1.129)	3.997*	(1.701)	4.020*	(1.770)
Pharmaceutical & biotechnology	-.994	(1.067)	-1.549	(1.020)		-2.106†	(1.260)	-2.703*	(1.291)	1.346	(2.106)	1.047	(2.025)
Technology hardware & equipment)	-1.480	(1.204)	-1.854	(1.201)		-2.115	(2.173)	-2.065	(2.201)	-.147	(1.123)	-.036	(1.168)

Textiles & apparel	-1.052	(1.115)	-2.097†	(1.093)	.189	(.876)	-1.354	(.833)	-3.292†	(1.930)	-3.016†	(1.821)
ROA 2004	.069	(.078)	.063	(.074)	.078	(.112)	.076	(.103)	.124	(.095)	.143	(.106)
ROA 2005	.208†	(.122)	.208†	(.116)	.129	(.146)	.128	(.134)	.281*	(.132)	.280*	(.127)
ROA 2006	.636***	(.123)	.631***	(.120)	.680***	(.151)	.683***	(.146)	.513***	(.079)	.493***	(.080)
Predictor variable												
Supply Chain Fit			-1.268***	(.359)			-1.640***	(.451)			1.044	(1.175)
R^2	.735		.743		.714		.728		.834		.837	
Adjusted R^2	.706		.715		.668		.681		.746		.744	
R^2 change			.009**				.013**				.003	
F	25.803***		25.852***		15.409***		15.723***		9.430***		9.018***	

Note. Robust (Huber-White) standard errors are in parentheses.

[a] Regression analysis not conducted due to small number of observations.

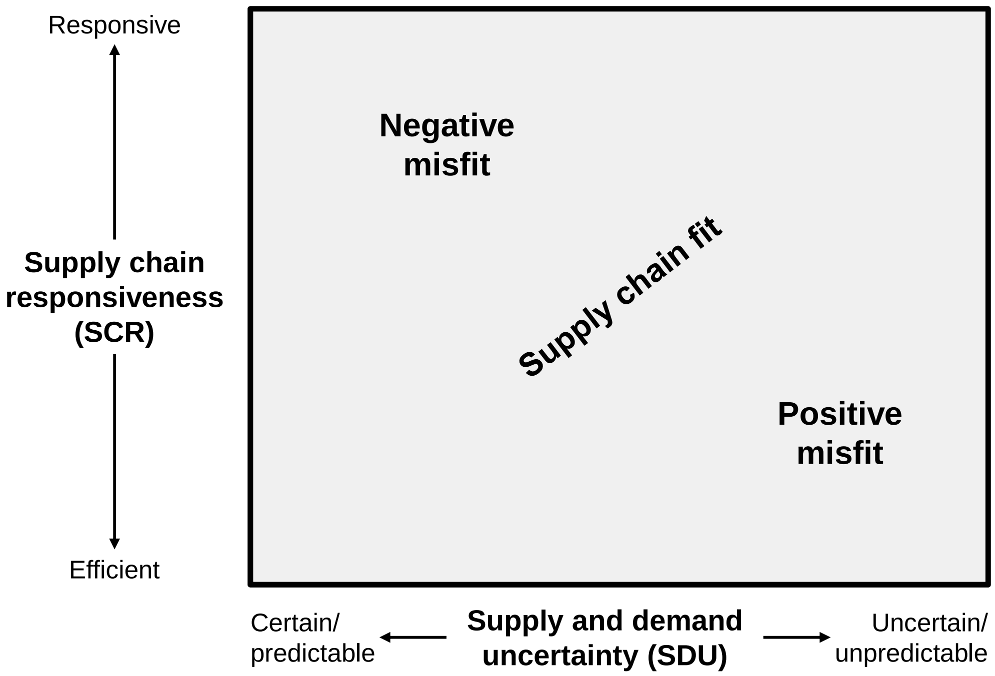
*** Significant at the .001 level (one-tailed).

** Significant at the .01 level (one-tailed).

* Significant at the .05 level (one-tailed).

† Significant at the .1 level (one-tailed).

Figure 1. Supply chain fit: match between supply and demand uncertainty (SDU) and supply chain responsiveness (SCR)



Note. Framework adapted from Chopra and Meindl (2010) and Fisher (1997).

Figure 2. Scatter plot of supply and demand uncertainty (SDU) versus supply chain responsiveness (SCR) scores for all firms

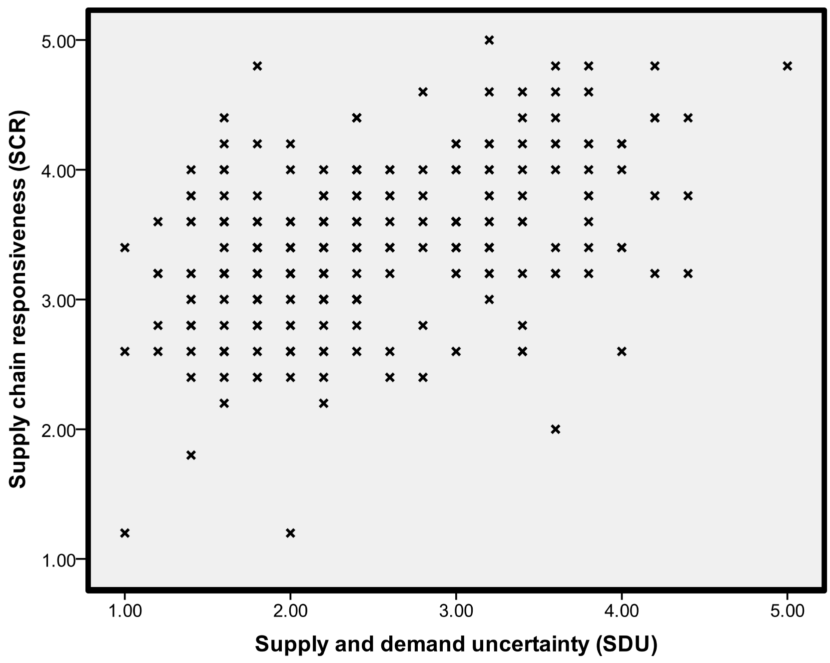
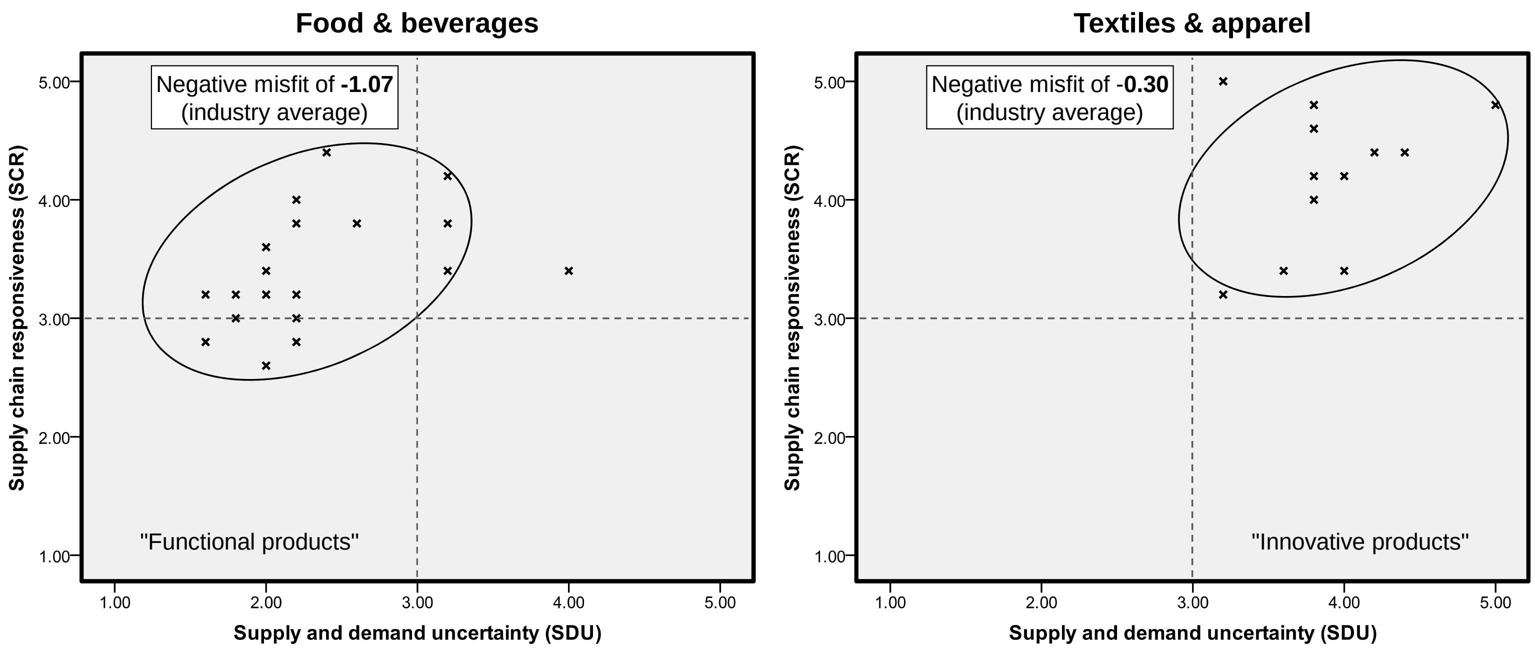


Figure 3. Scatter plot of supply and demand uncertainty (SDU) versus supply chain responsiveness (SCR) scores for two industries



Appendix. Average ROA and OLS regression results for different degrees of “fit” (within 1 SD, beyond 1 SD)

	Firms with fit (within 1 SD)				Firms with negative misfit (> 1 SD)				Firms with positive misfit (> 1 SD)
Number of firms	138				109				12
Average ROA	**7.12**				**5.58**				**7.41**
Independent variables	Model 1		Model 2		Model 1		Model 2		[a]
Intercept	3.340	(2.885)	4.775†	(2.797)	-1.545	(3.271)	.122	(3.383)	
Control variables									
Country France	.761	(.724)	.766	(.728)	-2.663*	(1.128)	-2.636*	(1.103)	
Country UK	-2.500	(1.530)	-2.597†	(1.478)	-6.302*	(2.672)	-6.401*	(2.635)	
Country Germany	-.531	(.648)	-.515	(.624)	-3.277†	(1.718)	-3.280†	(1.702)	
Firm age	.341	(.894)	.244	(.874)	2.349	(1.491)	2.512	(1.566)	
Firm size	-.459	(.319)	-.445	(.310)	.204	(.462)	.170	(.457)	
Competititive intensity	.154	(.486)	.109	(.467)	-.060	(.615)	-.062	(.607)	
Automotive & parts	-.037	(1.393)	.116	(1.400)	-.804	(1.159)	-.646	(1.161)	
Chemicals	-.485	(1.241)	-.430	(1.290)	.609	(1.389)	.535	(1.407)	
Construction & materials	-.872	(1.069)	-.381	(1.050)	.251	(1.412)	.190	(1.339)	
Electricity	.217	(1.371)	-.263	(1.298)	-3.863	(5.343)	-4.091	(5.270)	
Electronic & electrical equipment	.026	(1.412)	.060	(1.394)	-4.245	(3.147)	-4.086	(3.173)	
Food & beverages	-.442	(1.130)	-.225	(1.088)	-.536	(1.154)	-.757	(1.140)	
Forestry & paper	-3.007†	(1.643)	-3.184*	(1.450)	2.124*	(1.074)	1.849†	(1.039)	
Household goods & personal goods	-1.111	(.999)	-.949	(.990)	-2.038	(1.999)	-1.806	(2.030)	
Industrial & metals	-2.436*	(1.064)	-2.504*	(1.171)	-.223	(1.231)	-.511	(1.246)	
Machinery & plant construction	1.472	(1.472)	1.791	(1.466)	1.286	(1.729)	1.274	(1.677)	
Medical equipment	-.511	(1.312)	-.314	(1.220)	-1.641	(1.224)	-1.741	(1.241)	
Mining	-7.241**	(2.295)	-7.211***	(2.065)					
Oil & gas	1.396	(1.798)	2.013	(1.982)	-3.040*	(1.415)	-3.116*	(1.424)	
Pharmaceutical & biotechnology	-.978	(1.414)	-1.421	(1.246)	-2.127	(1.955)	-2.250	(1.895)	
Technology hardware & equipment	.179	(1.063)	-.219	(1.060)	-2.980	(2.106)	-3.280	(2.092)	

Textiles & apparel	-1.542	(1.438)	-2.015	(1.405)				
ROA 2004	.008	(.053)	.003	(.053)	-.026	(.156)	-.039	(.156)
ROA 2005	.240*	(.114)	.241*	(.107)	.354**	(.133)	.363**	(.134)
ROA 2006	.561***	(.114)	.565***	(.110)	.666***	(.162)	.665***	(.162)
Predictor variable								
Supply Chain Fit			-2.001*	(.829)			-1.069	(.792)
R^2	.798		.806		.752		.754	
Adjusted R^2	.753		.761		.685		.684	
R^2 change			008*				.002	
F	17.739***		17.770***		11.224***		10.750***	

Note. Robust (Huber-White) standard errors are in parentheses.

[a] Regression analysis not conducted due to small number of observations.

*** Significant at the .001 level (one-tailed).

** Significant at the .01 level (one-tailed).

* Significant at the .05 level (one-tailed).

† Significant at the .1 level (one-tailed).