Logistics and financial performance

An analysis of 424 Finnish small and medium-sized enterprises

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Abstract

Purpose – To explore the present logistics performance of Finnish small and medium-sized enterprises (SMEs) and to analyse the relationship between logistics performance and financial performance in these firms.

Design/methodology/approach – The dataset comprises 424 SMEs that participated in a nationwide Finnish logistics survey in 2006. Logistics performance measures were derived from the survey data, and based on these values logistically top-performing firms were identified within different industry groups. The financial performance of these firms was then examined *vis-à-vis* their industry peers using financial reports-based data.

Findings – The results imply that the overall level of logistics performance among the examined companies might be at such an elementary level that no statistically observable positive linkage between logistics performance and financial performance exists. The group of firms for whom logistics is a key source of competitive advantage in this sample is small and therefore statistical analysis at an industry level might be too aggregate to reveal this linkage. It is also surprising that service level and logistics cost efficiency are positively related; thus, companies who have a relatively high-service level tend to have relative low-logistics costs. These findings might imply that logistics is just starting to gain more attention among SMEs in Finland and at least in the short-term, it might be relatively easy for SMEs to gain competitive advantage by focusing more on logistics performance.

Originality/value – This study is the first large-scale attempt to focus on the logistics performance of SMEs and analyse the linkages between financial and logistics performance among the companies using both self-reported data and financial reports-based data. In addition, a theoretical framework of the linkages between logistics performance and financial performance is suggested and revised based on the findings of the study. The revised framework requires testing as a part of future research.

Keywords Supply chain management, Company performance, Financial performance, Small to medium-sized enterprises, Finland

Paper type Research paper

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Introduction

A substantial amount of research has been carried out on how to define and measure logistics and supply chain performance. The majority of this literature has focused on

constructing different performance typologies and performance measurement systems (Beamon, 1999; Chow *et al.*, 1994; Fawcett and Cooper, 1998; Gunasekaran *et al.*, 2001, 2004; Lai and Cheng, 2003; Lambert and Pohlen, 2001; Morgan, 2004), or describing certain types of benchmarking procedures (Blumberg, 1994; Bowersox *et al.*, 1999; Gilmour, 1999; Korpela and Tuominen, 1996; van Landeghem and Persoons, 2001). Existing literature has conceptualised logistics performance through a varying number of dimensions aimed at measuring the performance of a given logistics system. These typically include logistics costs and logistics service quality (Schramm-Klein and Morschett, 2006) as the principal dimensions, but more comprehensive performance measurement systems can include customer service/responsiveness/satisfaction, operational productivity, flexibility and time-based measures, for instance (Beamon, 1999; Morgan, 2004).

One of the widely used operationalisations of logistics performance (Stank *et al.*, 2001) consists of seven self-reported items regarding the firm's ability to meet certain abstract ends linked to order cycle times, reliability, responsiveness, flexibility, and estimated customer satisfaction. The used measures in this field of investigation are mainly "soft" (e.g. self-reported perceptual data) by nature. In contrast, the use of "hard" logistics performance measures (e.g. financial reports-based figures) is much less common. Such measures are typically used only in econometric modelling or simulation studies rather than in empirical studies (Chow *et al.*, 1994). Furthermore, the studied logistics performance measures are generally static, providing cross-sectional analysis of performance rather than a dynamic picture of performance development.

In terms of financial performance measurement, shareholder value and the quest for profitable growth tend to dominate used measures. In general, dynamic growth metrics can be classified under three different categories (Garnsey *et al.*, 2003):

(1) the growth of inputs such as investments or employees;

(2) the growth of the firm's value such as asset value, market capitalisation and economic value added; and

(3) the growth of outputs representing issues such as sales revenues or profits.

Delmar (1997) reviewed 55 and Weinzimmer *et al.* (1998) 35 studies focusing on growth with the conclusion that the growth of sales, employment, assets and market share dominate measures for growth. It is also well established that:

- a firm's relative growth decreases with the firm's age; and
- a firm's relative growth decreases with the firm's size (Evans, 1987a, b).

However, growth alone is not enough if it does not transform into added value for shareholders. Stewart (2004) identified the champions of profitable growth by combining revenue growth with market valuation and taking the total capital invested into account.

The purpose of this paper is to explore the present logistics performance of Finnish small and medium-sized enterprises (SMEs) and to analyse the relationship between logistics performance and financial performance in these firms. The empirical data of 424 SMEs comprises financial reports-based data combined with a data from a Finnish logistics survey (Naula *et al.*, 2006).

Finnish firms are well-suited for this type of analysis for a number of reasons. With a population of 5.2 million, Finland ranks among the 12 richest countries in the world using GDP/capita as a measure (US$40,197 in 2006). It is a highly industrialized open economy, with trade accounting for 65 per cent of GDP in 2005 (Statistics Finland, 2007). Finland was No. 2 in World Economic Forum's Global Competitiveness Index in 2005-2006 and 2006-2007, and No. 10 in IMD's *World Competitiveness Yearbook* in 2006 (www.wef.org and www.imd.ch). For several years, Finland has also been at the top of Transparency International's Corruption Perception Index as one of the least corrupt countries in the World. SME's comprised over 99 per cent of the 222,817 registered firms in Finland (as in the EU in general; see European Commission, 2003) and accounted for 43 per cent of the combined turnover of all firms in year 2000 (Statistics Finland, 2007).

Perhaps more important for this paper, the logistics environment in Finland is well developed, as indicated in the Logistics Performance Index, which is recently launched by The World Bank. Among the 150 countries studied, Finland is in the top 10 per cent with its LPI rank of 15 (www.worldbank.org/lpi). According to survey data from over 1,100 firms in the Baltic Sea Region collected in 2007, logistics costs of Finnish firms are, on average, at the same level as those for comparable firms in, for example, Northern Germany or Central Sweden (www.logonbaltic.info) Finland also has one of the highest internet broadband penetrations per capita in the World (OECD, 2006, p. 58). The business environment is, in other words, well developed. In addition to this, researchers can have access to reliable audited financial statistics of even unlisted firms.

The main contributions of the paper relate to its specific focus on SMEs and its relative large sample that includes and differentiates between different types of manufacturing and trade industries. Furthermore, the study adopts a multi-dimensional approach to both logistics and financial performance by combining hard, financial reports-based measures with soft, self-reported measures.

This paper is structured so that we first provide a review of literature in the field of logistics performance. The research design behind the paper is then described in more detail. Subsequently, the findings of the study are presented and discussed, and the paper is concluded with suggestions for further research in this field.

Literature review and proposed framework

Although logistics performance and financial performance have been widely studied, their distinct relationship has received limited empirical scrutiny, especially in the case of SMEs. In the logistics literature, it is generally assumed that outstanding logistics performance is associated with high-financial performance through low costs, high revenues and efficient and effective asset utilisation (Anderson *et al.*, 1997). High-logistics performance is associated with efficient and reliable operations, which imply overall cost efficiency and high-asset productivity. Furthermore, short cycle times allow the firm to react rapidly to market needs resulting in flexibility and increased ability to provide timely and innovative solutions as the distance between the firm and its customers is short. These features would allow the firm to reap increased revenue due to the superior quality related to its products or services (Ellinger *et al.*, 2000; Lambert and Burduroglu, 2000; Lambert and Pohlen, 2001; Venkatraman and Ramanujam, 1986).

Literature on supply chain management (SCM) has adopted a similar approach towards the link between operational and financial performance. At a conceptual level,

the relationship between logistics and SCM has been widely debated for over a decade and no consensus on this issue yet exists. In their recent article, Larson *et al.* (2007) identify four conceptual perspectives to the discussion on logistics versus SCM, which cover all possible ways the two fields might be interrelated in the context of business: logistics equals SCM (re-labeling), logistics subsumes SCM (traditionalist), logistics is subsumed by SCM (unionist), or logistics and SCM overlap partially (intersectionist). For the purposes of this study the terms logistics and SCM are used as synonymous concepts as the approach and measures used in performance studies are highly similar in these two fields. Furthermore, the Finnish term meaning "logistics" was used in the survey. This term is widely used in Finland in business and covers both logistics and SCM issues.

Given the importance of the issue, surprisingly limited empirical affirmation of a relationship between financial and logistics performance has been presented. For example, Schramm-Klein and Morschett (2006) found logistics performance, measured in terms of logistics costs and quality, to have a high-positive influence on the financial performance of retail firms. Similarly, the survey results of a study examining large manufacturing firms in Taiwan (Shang and Marlow, 2005) support the notion of a positive relationship between logistics and financial performance.

Overall, a more typical approach in contemporary logistics studies focusing on performance is to examine the relationship between specific logistics or SCM practices or so-called logistics capabilities (Bowersox *et al.*, 1999; Olavarrieta and Ellinger, 1997; Shang and Marlow, 2005) and financial performance based on a resource-based argumentation. For example, Sanders and Premus (2005), Wu *et al.* (2006) and Yusuf *et al.* (2004) have focused on the relationship between logistics management practices and financial performance arguing that factors such as firm IT capability, internal and external collaboration, and supply chain integration improve firms' financial performance. Also a number of studies have focused on the distinct relationship between logistics management-related factors and logistics performance. For example, the study by Closs *et al.* (2005) finds that flexible logistics programmes and internal collaboration have a positive influence on logistics performance. In contrast, the study by Stank *et al.* (2001) reports the relationship between external collaboration and logistics performance to be insignificant.

In the outlined body of literature, certain limitations relate to the nature and scope of completed studies, which specifically address the distinct relationship between logistics and financial performance. In these studies both logistics and financial performance are typically measured using only self-reported perpetual indicators and single respondents, which capture the impression of one single person at one specific point in time. Furthermore, as noted by Chow *et al.* (1994), few logistics studies on performance adequately capture the multiplicity of goals in order to evaluate both logistics and financial performance in a holistic manner.

Also a number of consultancy-type studies have been completed in this field of investigation (European Logistics Association and A.T. Kearney, 2004; World Global Logistics Research Team, Michigan State University, 1995). These studies have commonly arrived at the conclusion that excellence in logistics is directly connected with outstanding financial performance (D'Avanzo *et al.*, 2003). For example, in a recent of study of Southeast Asian firms, Kremers *et al.* (2005) examine the relationship between supply chain operations reference model metrics and financial metrics, both of which are

measured using "hard" self-reported operational figures. The study findings give indications of a weak link between financial and supply chain performance. However, a common drawback of consultancy-type studies is that they do not describe the applied methodology in detail, which makes the assessment of results rather difficult.

Another typical feature for studies in this field, especially in terms of consultancy-type studies, is that respondent firms are mainly relative large firms. These firms can be assumed to have rather advanced know-how relating to how logistics should be managed due to their greater possibility of dedicating resources to such issues compared to SMEs (Kadiyali *et al.*, 2000; Wilkinson, 1996). In addition, large firms tend to possess considerable bargaining power *vis-à-vis* their suppliers and/or customers. This enables large firms to negotiate better terms and leaves more room for manoeuvring in many logistics, marketing and purchasing operations compared to SMEs (Crook and Combs, 2007; Emerson, 1962; Stigler, 1968).

It might also be assumed that outstanding logistics performance would also have a positive effect on stock prices in addition to direct effects relating to reduced costs and enhanced revenues (Christopher and Ryals, 1999; Walters, 1999). Recent studies have, for example, provided evidence suggesting that markets react to the adoption of SCM enhancement tools and technologies in a positive manner (Filbeck *et al.*, 2005) and to sudden drops in supply chain performance in a negative manner (Singhal and Hendricks, 2002).

The linkage between logistics performance, related management practices and overall financial performance is difficult to detect in large corporations as logistics practices applied in separate organisational units may differ widely. Thus, a consolidated financial report is typically too rough a measure for a meaningful analysis. This is less of a problem when examining SMEs. SMEs tend to have common characteristics which distinguish them from larger firms (Gartner, 1985). These features pose both advantages (e.g. increased flexibility) and limitations (e.g. limited resources, opportunities for benefiting from economies of scale) to the operation of small firms *vis-à-vis* their larger competitors. Overall, there has been limited logistics research specifically focused on SMEs, and thus knowledge is limited in terms of the level of logistics as well as regarding the relationship between logistics performance and financial outcomes in these firms.

In the context of the present study, logistics performance is understood to cover the dimensions of cost efficiency (Beamon, 1999; Chow *et al.*, 1994; Closs *et al.*, 2005; Gunasekaran *et al.*, 2004; Lambert and Pohlen, 2001; Rosenweig *et al.*, 2003; Schramm-Klein and Morschett, 2006; Yusuf *et al.*, 2004), service quality (Beamon, 1999; Chow *et al.*, 1994; Closs *et al.*, 2005; Fawcett and Cooper, 1998; Gunasekaran *et al.*, 2004; Lambert and Pohlen, 2001; Rosenweig *et al.*, 2003; Schramm-Klein and Morschett, 2006; Shang and Marlow, 2005; Stank *et al.*, 2001) as well as time-related factors (Chow *et al.*, 1994; Closs *et al.*, 2005; Fawcett and Cooper, 1998; Gunasekaran *et al.*, 2004; Lambert and Pohlen, 2001; Morgan, 2004; Rosenweig *et al.*, 2003; Schramm-Klein and Morschett, 2006; Yusuf *et al.*, 2004), which have been commonly featured in previous studies. In terms of the relationship between logistics performance and financial outcomes, a positive relationship is presumed to prevail between the two. Resultant low costs, high revenues and efficient and effective asset utilisation from high-logistics performance are assumed to reflect on the financial performance of the firm through higher profitability and productivity as well as opportunities to grow faster relative to its competitors in a certain industry.

Research design

Dataset

The empirical data of the study comprises a sub-sample of data from a nationwide Finnish logistics survey (Naula *et al.*, 2006) combined with detailed financial reports-based data extracted from the Amadeus database. Figure 1 shows how the analysed dataset was constructed. The survey data were gathered with the help of a web-based questionnaire. An invitation to participate with a unique link to the questionnaire was sent to 16,231 personal e-mail addresses of all the members of the Finnish Association of Logistics and the Federation of Finnish Enterprises in spring 2006. The responses were not anonymous since each respondent was identified by the unique link in the invitation. This allowed the mapping of the responses to the financial data. In addition to the survey, 106 telephone interviews were conducted resulting in a total of 2,255 responses and a response rate of 13.9 per cent. The questionnaire was relative lengthy and complex and the telephone interviews were used to crosscheck that possible misunderstandings do not bias the results as well as to ensure full geographical coverage. The respondent could choose to answer on behalf of her/his respective business unit or the firm as whole.

The survey sub-sample analysed in this paper consists of those manufacturing, wholesale, and retail trade respondent SMEs whose financial data were available for the year 2004 in the Amadeus database. Firms whose survey responses were reported

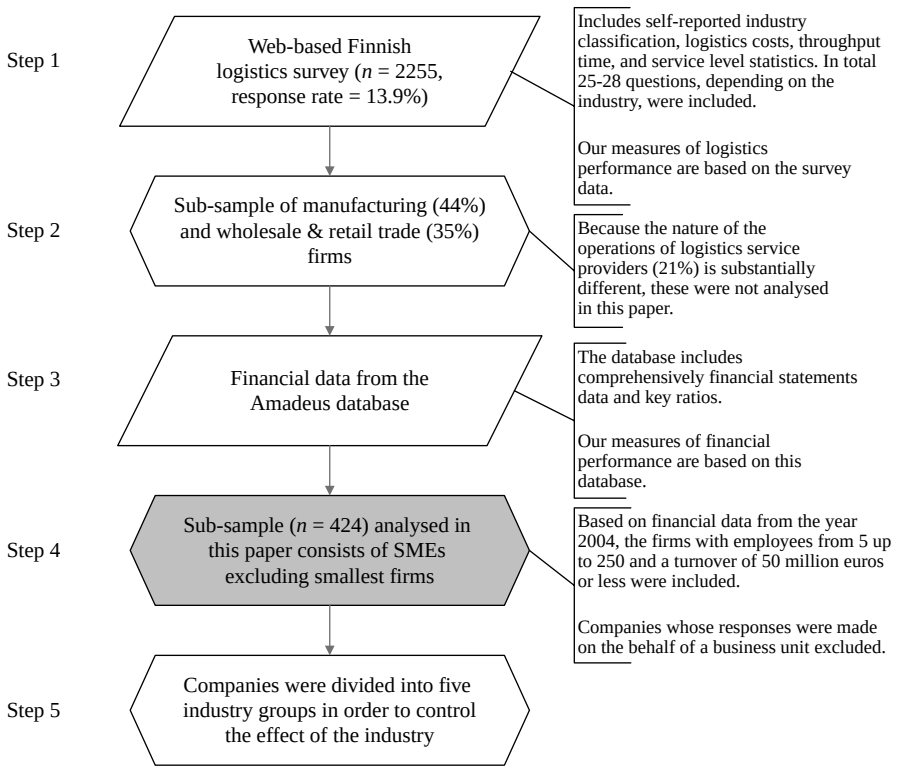


Figure 1.
Data sources and procedures used in the study

at a business unit level were excluded from the sample because business unit level financial data were not available. We used 2004 data to determine if a firm qualified as a SME using the criteria "less than 250 employees and a turnover of €50 million or less". For example, Eurostat defines an SME as an enterprise which has fewer than 250 employees; and either an annual turnover of €50 million or less; or an annual balance-sheet total of €43 million or less.

To improve the reliability of the results, the financial data for SMEs with less than five employees were considered to be potentially too unreliable for the purposes of the study. This relates, e.g. to eligibility to certain employment and start-up subsidies, taxation treatment and related auditing requirements of the smallest firms, including self-employed persons. For example, the owner's salary is often not fully included into the costs (i.e. costs are lower than they should be) and the owner might live in the house owned by the firm (i.e. assets are higher than they should be). Such issues might significantly affect conclusions on profitability. As a consequence, firms that employed less than five employees in the year 2004 were excluded from the sample. This demarcation point is somewhat arbitrary but the results seemed not to be sensitive if it is slightly increased. If the employee count was not reported, the firm was excluded. We believe that this final sample is homogeneous enough for the size of the firm not to bias the results.

Industry is a typical domain of reference in strategic analysis and numerous strategy analysis tools like Porter's (1980) competitive forces of industry have been suggested for industry level analysis. Logistics operations, costs structures as well as competitive situation vary significantly from one industry to another. In low-value adding activities such as in cement production, logistics costs can make up to 46 per cent of sales turnover, whereas in high-value adding activities such as computer supply these may account for less than 2 per cent (Rushton *et al.*, 2006, pp. 12, 27-8; Naula *et al.*, 2006, pp. 115-16), Therefore, it is necessary to control both the effect of an industry, and also the possible impact of value adding potential among industries.

First, the industry was controlled for by dividing the firm into five industry groups. When answering the initial survey, the respondents chose an industry that best described their activities from a list based on the standard EU industry classification NACE 2002, used by Statistics Finland. It was assumed that these self-reported industries are likely to describe the true activities of the firm in a better manner than industry classification data originating from the company register as SMEs do not necessarily keep their registry data up-to-date. Thus, the applied industry grouping shown in Table I is based on self-reported industries.

Second, manufacturing firms were divided based on their gross value added (GVA) per employee in the year 2004 into high-value adding industries ($n = 84$) and low-value adding industries ($n = 123$). The demarcation point between the two is arbitrary and, in reported analyses, it was set so that the size of the groups is close to each and there is relatively large difference between the GVA per employee of the industries on both sides of the limit. However, the results are neither sensitive to the exact location of demarcation point nor to how many industry groups are used. The next group consisted of construction firms ($n = 63$), one of wholesale firms ($n = 84$), and one included retail firms ($n = 70$).

	GVA in production per employee in 2004 (1,000 €)	*n*
Manufacturing industry group 1		84
Manufacture of electrical and optical equipment	292	20
Manufacture of chemicals, chemical products and man-made fibres	233	6
Manufacture of pulp, paper and paper products; publishing and printing	145	4
Publishing, printing and reproduction of recorded media	137	16
Manufacture of machinery and equipment	102	33
Manufacture of transport equipment	102	5
Manufacturing industry group 2		123
Manufacture of rubber and plastic products	90	16
Manufacture of other non-metallic mineral products	85	7
Manufacture of basic metals and fabricated metal products	84	50
Manufacture of food products, beverages and tobacco	79	14
Manufacture of wood and wood products	61	28
Manufacture of textiles and textile products	60	5
Manufacture of leather and leather products	49	3
Construction		63
Retail sale		70
Retail sale of food, beverages and tobacco	–	11
Retail sale of other than food, beverages and tobacco	–	36
Sale of motor vehicles and motor vehicle parts and accessories	–	23
Wholesale		84
Wholesale of food, beverages and tobacco	–	10
Wholesale other than that of food, beverages and tobacco	–	61
Wholesale on a fee or contract basis	–	13
Total		424

Table I.
Industry groups used

Source: GVA data from Statistics Finland (2007)

Measurement and analysis

Logistics and financial performance were operationalised by using multiple measures for both logistics and financial performance. When measuring financial performance, both growth and profitability were covered. According to Delmar (1997) and Weinzimmer *et al.* (1998) the growth of sales, employment, assets and market share dominate measures for growth. From these the growth was measured by:

- the average turnover growth rate from 2002 to 2004 (according to Finnish accounting standard sales is not reported separately but turnover is very close to it); and
- the average asset growth rate from 2002 to 2004.

Market share data were not available. Since, the studied companies are not public, we could not construct a measure of added shareholder value like, e.g. Stewart (2004) did. However, it is well established that in case of small business "profitability is best judged by net earnings per dollar of assets in a business" (Edmunds, 1979). Thus, profitability was measured by:

- the average return on total assets from 2002 to 2004;
- the average return on capital employed from 2002 to 2004; and
- the average EBIT-per cent from 2002 to 2004.

EBIT-per cent was included in order to check whether profitability behaved differently compared to asset-based measures. We also crosschecked our results by testing with other related measures derived from financial reports-based data, but regardless of the measures used, the overall conclusions remained the same.

Logistics performance was operationalised through two different approaches. The first approach was to ask respondents directly how they perceive their logistics performance and their competitors' logistics performance and the second one was to construct theoretical measures of the construct. The first approach yields four groups as shown in Figure 2. Since, the importance of logistics is likely to increase, we have referred to companies, who perceive their own and competitor's logistics performance to be at a relatively high level, as forerunners. The majority of the companies seem still to be complacent and view their own and competitors' logistics performance to be, at best, at a medium level. The group of leaders, i.e. where the company's own performance is seen high and better than that of competitors, is relative small.

The second approach was to identify theoretical dimensions of logistics performance. Based on literature, they are as follows: service level characterising the service quality, operational metrics characterising the time-based logistics performance (smaller values refer to better performance), and logistics costs characterising cost efficiency (smaller values refer to better performance). The measures for the dimensions were constructed from the questions shown in Figure 3. The overall measures for operational metrics and logistics costs were attained by summarising their individual components but, in case of service level, the value assigned to the firms was produced by first ranking firms based on the question S1 (larger the better) and then applying the same procedure to these results based on question S2 (smaller the better) rankings (Figure 3).

In order to draw conclusions on the linkage between logistics performance and financial performance, firms within each industry group were divided based on their logistics performance into two mutually exclusive categories: top-performing firms

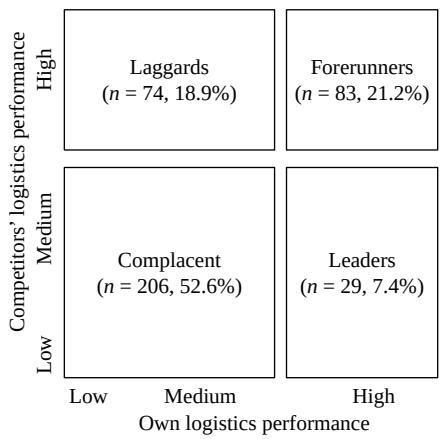


Figure 2.
Own and competitors' logistics performance ($n = 392$)

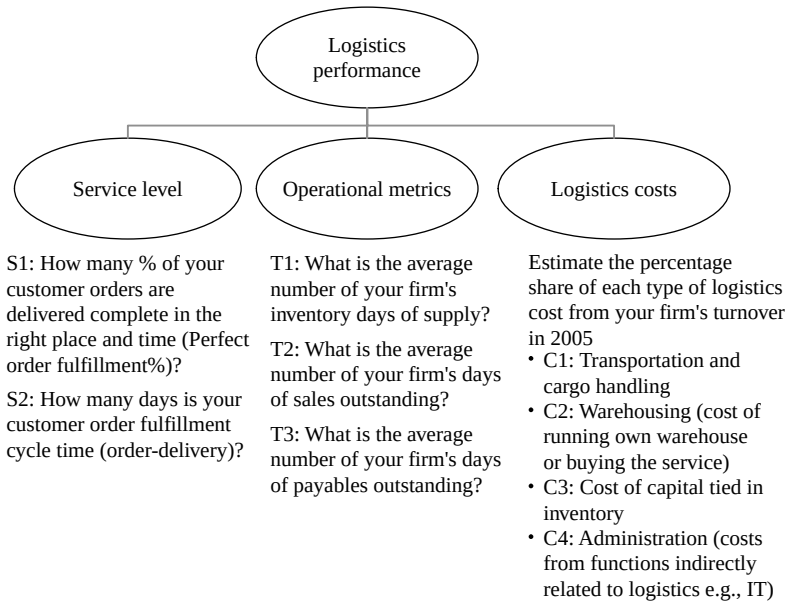


Figure 3.
Dimensions and sub-components of logistics performance

and the rest of the firms. This was done in order to examine whether firms in these two categories differed in terms of financial performance. Thus, the top-performance categorisation was used only in case of logistics performance – not in case of financial performance. This is because we expected that logistically top-performing firms would also perform relatively well in financial terms as logistics can be seen as one of the drivers of financial performance.

Top performance itself is a tricky concept and it can refer to, for example, best-in-class firms or a certain percentile of top performers. In this paper, top performing firms were defined to be the best 10 per cent of the firms within each industry group (Bolstorff and Rosenbaum, 2003). The results were cross-checked using the best 25 per cent of the firms as top performing – this did not alter the results, as is also illustrated in Appendix 1.

In order to establish whether a given firm qualified as a top performer in its respective industry group, the dimensions of logistics performance shown in Figure 3 were combined into an overall industry ranking by:

- calculating the firm's ranking within each dimension of logistics performance; and then
- combining these rankings in order to achieve an overall ranking for the firm in question.

Each dimension was given an equal weight in the overall ranking and possible missing observations were replaced with industry medians.

Findings

In order to analyse the linkage between logistics and financial performance, we first examine these performance constructs separately starting from financial performance measures. After that the analysis moves to logistics performance. First, the linkages

between separate logistics performance dimensions are studied and then the, differences between top-performing firms compared to their counterparts are analysed industry-by-industry. Finally, the financial performance of different kinds of companies based on self-evaluation (leader, laggards, forerunners, and complacent) is analysed.

In terms of financial performance measures, the Pearson correlation coefficients between these measures are shown in Table II. They seem to behave as expected based on the prior research. It seems that the growth metrics (average growth of turnover and average growth of assets) are significantly and strongly positively correlated. The profitability metrics (average EBIT-per cent, average return on total assets, and average return on capital employed) are also intercorrelated. However, the metrics for profitability and growth are not statistically significantly correlated and the coefficients are close to zero.

Table III shows descriptive statistics for the individual dimensions of logistics performance as well as for the variables they are constructed from. All variables show skewness and excess kurtosis but there seems to be variability on each of them that suggests that they should be able to differentiate between the firms.

Pearson correlation coefficients between the variables from which the dimensions of logistics performance are constructed are shown in Table IV. The variables from which each dimension is constructed are significantly correlated (at 0.01 risk level). Somewhat surprising is that all cost items are relatively strongly positively related since it could be expected that higher transportation costs lead to lower warehousing and lower inventory costs. However, this trade off seems not to exists which could imply that total costs might be more related to general level of logistics management rather than explicit optimization and trade-offs between transportation costs, warehousing, and lower inventory costs. It would also be a feasible assumption that higher logistics costs improve service quality. Although the correlations are statistically significant, they are relative small and in case of perfect order fulfilment the coefficient is negative. This might again be related to the possible generally low level of logistics performance among SMEs and suggest that those companies who do it right for the first time enjoy some cost savings – thus, the companies

	Turnover growth (per cent)	Assets growth (per cent)	ROCE-per cent	ROA-per cent	EBIT-per cent
Turnover	1.000				
N	403				
Assets	0.587**	1.000			
N	403	405			
ROCE	−0.032	0.011	1.000		
N	392	394	412		
ROA	−0.052	−0.006	0.690**	1.000	
N	402	404	411	423	
EBIT-per cent	0.039	0.04	0.466**	0.800**	1.000
N	402	404	411	423	423

Notes: *Significant at the 0.05 level (two-tailed); **significant at the 0.01 level (two-tailed). EBIT-per cent, earnings before interest and taxes as percentage from turnover; ROA, return on assets; ROCE, return on capital employed

Table II.
Pearson correlation coefficients for financial performance measures (2002-2004 averages)

	N	Mean	Std. error	SD	Skewness	Kurtosis
Operational metrics[a]	424	34.070	2.091	43.055	2.115	6.723
+ T1	367	40.523	2.27	43.487	2.19	6.187
+ T2	373	23.371	0.66	12.74	1.694	4.924
− T3	377	27.447	0.734	14.258	1.700	5.552
Logistics costs[a]	424	16.160	0.516	10.621	1.550	3.541
+ C1	353	5.020	0.222	4.162	2.118	6.239
+ C2	366	4.014	0.205	3.916	1.870	4.268
+ C3	349	5.246	0.301	5.626	1.554	1.755
+ C4	338	2.876	0.176	3.241	2.676	10.339
Service level[a]	424	Not feasible because just ranking order was produced				
S1 (1. rank)	378	91.205	0.659	12.809	− 3.528	15.956
S2 (2. rank)	356	15.653	1.37	25.856	3.626	18.033

Note: [a]When calculating the value, possible missing observations were replaced with industry medians

Table III.
Descriptive statistics for the dimensions of logistics performance

might be still be far from the productive frontier that allow them to reduce costs and increase service level at the same time. On the other hand, the second component of service level is negatively correlated with all cost items as could be expected.

Although the analyses reported in this paper were done by finding out the ranking order of the companies, we also cross-checked with factor analysis how the variables tend to be related. The rotated solution is given in Appendix 2 and was derived from correlation matrix because the scales of variables are different. Based on Kaiser-Mayer-Olkin measure of sampling adequacy (0.625) the factor analysis is tolerable. On the three factor model, the peak loadings of variables are like the framework suggests. Confirmatory factor analysis was not feasible because the distributional assumptions that maximum likelihood estimations necessitated are violated.

Table V shows Spearman's ρ correlation coefficients for the rankings on each dimension of logistics performance. As we analyse rank orders, most of the values are unique. In such a case, the Spearman's ρ is the most suitable correlation coefficient. When interpreting the data, for example, the positive correlation between logistics costs and service level implies that firms which scored high on service level (= relative good service level) tend to have scored well on logistics costs (= relative low-logistics cost). All correlation coefficients are statistically significant at the 0.05 risk level but are relative low implying that the used dimensions of logistics performance are distinct from each other.

The next issue to consider is how the financial performance measures and components of logistics performance are related. Table VI depicts the Spearman's ρ correlation coefficients for financial performance measured and dimensions of logistics performance. All correlation coefficients are relatively close to zero and the service level is only significantly correlated with ROCE and ROA as well as logistics performance with ROCE. Thus, there seems to be no observable large-scale linkage on this dimensional level.

Figure 4 shows the median values of different financial performance measures for the five industry groups identified. Furthermore, the figure illustrates differences between the logistically best performing firms compared to the rest of the sample within each industry group. Medians were used to measure the central tendency as distributions

Table IV. Pearson correlation coefficients between the variables of logistics performance

	T1	T2	T3	S1	S2	C1	C2	C3
T2	*0.2210* **	*1*						
T3	*0.2189* **	*0.3767* **	*1*					
S1	0.0363	−0.0727	−0.1033*	*1*				
S2	0.0770	0.1352	0.0941	*−0.1937* **	*1*			
C1	−0.0072	0.0139	0.0946	−0.1224*	−0.0727	*1*		
C2	0.1400	0.0582	0.1077*	−0.1657**	−0.1123*	*0.3513* **	*1*	
C3	0.0368	0.0396	0.1486**	−0.1921**	−0.0689	*0.1803* **	*0.4800* **	*1*
C4	−0.0328	−0.0465	−0.0413	−0.0962	−0.1274*	*0.3678* **	*0.4932* **	*0.4061* **

Notes: *Correlation is significant at the 0.05 level (two-tailed); **correlation is significant at the 0.01 level (two-tailed)

were skewed with few very high values reflecting strongly on mean values. The statistical significance of the differences in median values between the top-performing and the other firms was tested by applying the Mann-Whitney test. However, the only statistically significant difference was found to be in the case of turnover growth in high-value added manufacturing industries (Manufacturing 1). Nevertheless, because the size of top-performing groups is small compared to the rest of the companies, relatively high difference in medians would be needed to get statistically significantly different results. Detailed statistics on these tests are presented in Appendix 3.

Although practically no statistically significant differences exist, moderate tendencies were found. Especially, in the case of retail and wholesale trade the logistically best performing firms had a tendency to grow faster and still remain profitable. This might be related to the greatly intensified competition as a result of the market entry of large discount chains such as the German-based Lidl that entered into the Finnish market in 2002. It is also conceivable that in these industries the fastest growing firms have been paying increasing attention to logistics performance and perhaps at least partly due to that managed to remain at least as profitable as other firms. More detailed analyses are shown in Appendix 1 where EBIT-per cent and the average growth of turnover are plotted as pairs for top performing and other firms. This analysis confirms further that there is no large-scale, observable pattern indicating that logistically top-performing firms would be more profitable and/or growing faster than other firms in their industry.

Finally, the results were crosschecked by using the self-evaluation of the firms as a measure of their logistics performance as shown in Figure 2. This analysis could not be performed at an industry level due to the limited number of observations. The number of different kinds of companies within each industry group is given in Table VII.

Table V.
Spearman's ρ correlation coefficients ($n = 424$) for the rankings on the dimensions of logistics performance

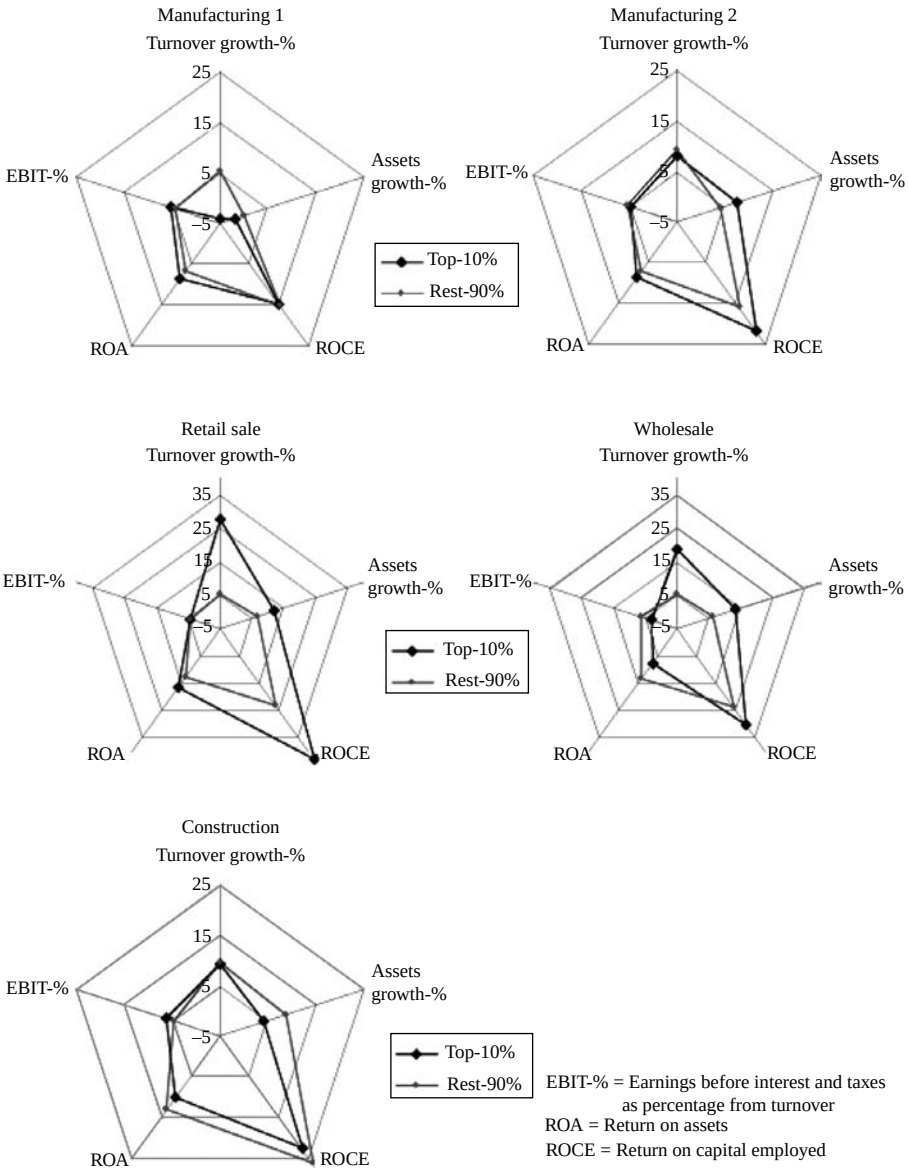
	Service level	Operational metrics	Logistics costs	Logistics performance
Service level	1.000			
Operational metrics	0.111*	1.000		
Logistics costs	0.252**	0.115*	1.000	
Logistics performance	0.6035**	0.5313**	0.5593**	1.000

Notes: *Correlation is significant at the 0.05 level (two-tailed); **correlation is significant at the 0.01 level (two-tailed)

Table VI.
Spearman's ρ correlation coefficients for financial performance measured and dimensions of logistics performance

	Turnover	Assets	ROCE-per cent	ROA-per cent	EBIT-per cent
N	403	405	394	404	404
Logistics performance	−0.0041	−0.0389	−0.1147*	−0.0931	−0.0183
Service level	0.0422	−0.0541	−0.1192*	−0.1476**	−0.0920
Operational metrics	−0.0235	−0.0558	−0.0332	0.0487	0.1208*
Logistics costs	0.0125	0.0502	−0.0739	−0.066	0.0174

Notes: *Significant at the 0.05 level (two-tailed); **significant at the 0.01 level (two-tailed). EBIT-per cent, earnings before interest and taxes as percentage from turnover; ROA, return on assets; ROCE, return on capital employed



Note: The scale is percentages

Figure 4.
Median values of different financial performance measures for the five industry groups identified: comparison of top performers and their peers

It seems that, in relative terms, there are many leaders in the retail sale industry and relatively many forerunners in wholesale. We would expect that especially leaders (level of own logistics is high and competitors' at most medium) would outperform their peers also financially. It is interesting to notice that the relative number of leaders is highest in the retail sale industry, which also was a industry were the earlier analysis suggested that the logistically best performing firms had a statistically insignificant tendency to grow faster and still remain profitable. However, its should be noted that the self-evaluation based framework and the logistics performance approach are not directly comparable as top performers were defined through a fixed percentile of firms within each industry while the number of self-evaluated high performers varied from one industry to another. In addition, the comparison of financial performance measures over the industry boundaries is infeasible in the context of this paper.

Medians of financial performance measures for different kinds of firms are given in Table VIII but because industry is not controlled it is not known if the minor differences are explained by it that is likely. Unfortunately, pairwise testing of medians for statistical significance is not feasible and there is no well established ANOVA-type of approach for testing medians (if ANOVA is being used, the differences are not statistically significant).

In general, the amassed findings support the possibility that logistics has not yet emerged as a large-scale driver of competitiveness among Finnish SMEs. Thus, it might be that with a little emphasis on logistics, SMEs could gain at least some short-term advantage.

Discussion

The purpose of this paper was to explore the present logistics performance of Finnish SMEs and to analyse the relationship between logistics performance and financial

Table VII.
Different kinds of firms within each industry group

	Complacent	Laggards	Leaders	Forerunners
Manufacturing group 1	48	12	3	17
Manufacturing group 2	60	22	9	24
Construction	34	12	1	8
Retail sale	32	9	10	12
Wholesale	32	19	6	22
N (total 392)	206	74	29	83

Table VIII.
Medians of financial performance measures for different kinds of firms

	Turnover	Assets	ROCE-per cent	ROA-per cent	EBIT-per cent
Complacent	8.93	7.07	21.72	10.04	5.04
Laggards	7.64	4.20	20.86	10.28	5.39
Forerunners	4.48	3.87	17.93	8.06	4.89
Leaders	3.41	3.72	17.88	7.95	4.55
Overall	6.84	5.42	20.07	9.71	5.03

Notes: EBIT-per cent, earnings before interest and taxes as percentage from turnover; ROA, return on assets; ROCE, return on capital employed

performance in these firms. Finland was considered a representative case country because of the availability of reliable financial reports-based data and its ranking among top 10 per cent countries based on the World Bank's Logistics Performance Index, No. 2 ranking in World Economic Forum's Global Competitiveness Index, and No. 10 in IMD's *World Competitiveness Yearbook* in 2006.

In this paper, we were able to combine extensive survey data from 2006 with audited financial statements from 2002 to 2004 covering 424 Finnish manufacturing, trade and construction SMEs. This unprecedented dataset allows rigorous and detailed analysis of logistics and financial performance. Such detailed analysis in terms of SMEs has not been reported in logistics literature before. It should be noted that the applied approach would not be feasible in case of large firms that tend to publish only consolidated financial statements; i.e. "hard" financial performance indicators and survey-based logistics performance indicators of operational units would invariably have a different level of observation.

The link between logistics performance and financial performance has received some scholarly attention (Schramm-Klein and Morschett, 2006; Shang and Marlow, 2005) and a positive connection between these two aspects of performance is generally assumed in case of large enterprises. However, rigorous empirical research in this field is scarce in terms of SMEs. Nevertheless, Arend and Wisner (2005) found that SCM is negatively associated with SME performance after controlling for self-selection bias. Our results in turn do not support the notion that a large-scale observable link would already exist between financial and logistics performance among SMEs.

Overall, we found no statistically significant large-scale differences in terms of profitability or growth between firms performing well in terms of logistics and other firms in the respective industry. Although not statistically significant, in the retail and wholesale industries there was a mild tendency suggesting that the logistically best performing firms might grow faster and still remain profitable. This observation makes sense intuitively as logistics is likely to be relatively more important in these industries and competitive pressures have increased substantially due to the entry of international retailers into domestic markets. These two industries were also characterised by a relatively large share of leader and forerunner companies. Thus, logistics performance might become a true performance differentiator also for SMEs within these industries in the near future and perhaps the other industries will follow later.

The absence of a statistically significant relationship between financial and logistics performance may also be related to the overall low level of logistics performance among SMEs studied. The Finnish Logistics Survey (Naula *et al.*, 2006) also clearly indicated that in large firms the level of logistics costs is lower and the scores of several logistics performance indicators were better compared to SMEs. Our analyses gave similar indications as, for example, all logistics cost items were positively related although it could be expected that higher transportation costs would lead to lower warehousing and inventory costs. Better performance in terms of perfect order fulfilment was also related to lower logistics costs. These observations suggest that SMEs might still be far from the productive frontier which would allow them to reduce costs and increase the service level at the same time. Nevertheless, the sample includes individual firms for whom logistics is already a source of competitive

advantage but no statistical method is capable of reliably to identify such single firms from the mass.

All in all our findings suggest that logistics might just be starting to gain more attention among SMEs in Finland and at least in the short-term, it might be relatively easy for SMEs to gain competitive advantage by focusing more on logistics performance.

In terms of future research, it seems that also other contextual or firm specific factors may have to be considered when studying the linkage between logistics and financial performance of SMEs because, as the results indicate, logistics issues are not yet in the forefront in determining the financial performance of SMEs at an aggregate level. Furthermore, such firms have often limited scope to negotiate and configure their logistics as well as marketing and sourcing operations *vis-à-vis* their suppliers and/or customers. Thus, it would make sense to examine factors behind the aggregate performance metrics and to examine the distinct logistics management profiles of SMEs and relevant contextual factors regarding their business environment. It is likely that in certain context some logistics profiles are more efficient than others. Furthermore, observable patterns may exist in terms of how these profiles evolve as firms grow and mature as well as when their industries mature. Thus, the strategic importance of general excellence in logistics or a certain combination of logistics profile elements may differ from one context to another. The framework shown in Figure 5 summarises these issues.

The featured logistics profile elements shown in Figure 5 were derived from existing literature outlined earlier and results of this study. While a few studies have made contributions to this field by addressing all three layers of performance shown in Figure 5 (Rosenweig *et al.*, 2003; Schramm-Klein and Morschett, 2006; Shang and Marlow, 2005), the common approach is either to examine logistics performance through a conceptual or consultancy-oriented lens, or only address specific relationships within the framework. Therefore, a natural avenue for future research would be to extend studies in the direction shown in Figure 5 where logistics performance would be addressed together with its antecedents and consequences in a holistic manner and the suggested framework would be operationalised and tested in SME-specific context.

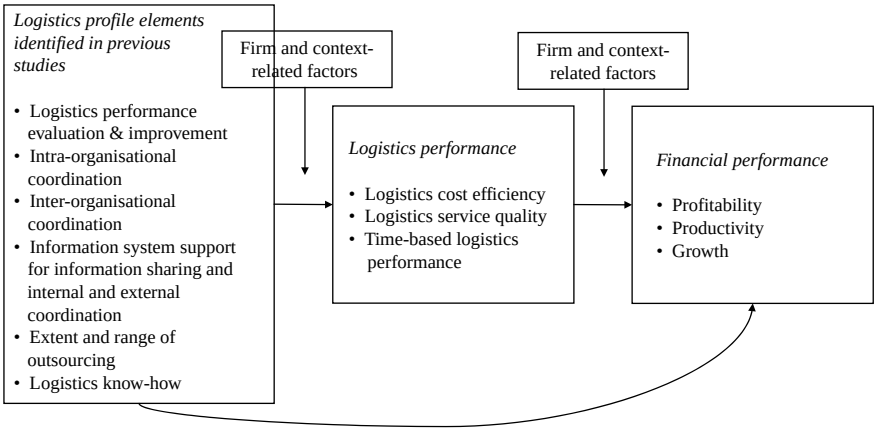


Figure 5.
Refined framework of logistics performance

References

Anderson, D.L., Britt, F. and Favre, D. (1997), "The seven principles of supply chain management", *Supply Chain Management Review*, Vol. 1, pp. 31-43.

Arend, R.J. and Wisner, J.D. (2005), "Small business and supply chain management: is there a fit?", *Journal of Business Venturing*, Vol. 20 No. 3, pp. 403-36.

Beamon, B.M. (1999), "Measuring supply chain performance", *International Journal of Operations & Production Management*, Vol. 19 No. 3, pp. 275-92.

Blumberg, D.F. (1994), "Strategic benchmarking of service and logistics support operations", *Journal of Business Logistics*, Vol. 15 No. 2, pp. 89-119.

Bolstorff, P. and Rosenbaum, R. (2003), *Supply Chain Excellence: A Handbook for Dramatic Improvement using the SCOR Model*, American Management Association, New York, NY.

Bowersox, D.J., Closs, D.J. and Stank, T.P. (1999), *21st Century Logistics: Making Supply Chain Integration a Reality*, Council of Logistics Management, Chicago, IL.

Chow, G., Heaver, T.D. and Henriksson, L.E. (1994), "Logistics performance: definition and measurement", *International Journal of Physical Distribution & Logistics Management*, Vol. 24 No. 1, pp. 17-28.

Christopher, M. and Ryals, L. (1999), "Supply chain strategy: its impact on shareholder value", *International Journal of Logistics Management*, Vol. 10 No. 1, pp. 1-10.

Closs, D.J., Swink, M. and Nair, A. (2005), "The role of information connectivity in making flexible logistics programs successful", *International Journal of Physical Distribution & Logistics Management*, Vol. 35 No. 4, pp. 258-77.

Crook, T.R. and Combs, J.G. (2007), "Sources and consequences of bargaining power in supply chains", *Journal of Operations Management*, Vol. 25 No. 2, pp. 546-55.

D'Avanzo, R.H., von Lewinski, H. and van Wessenhove, L.N. (2003), "The link between supply chain and financial performance", *Supply Chain Management Review*, Vol. 7 No. 6, pp. 40-7.

Delmar, F. (1997), "Measuring growth: methodological considerations and empirical results", in Donckels, R. and Miettinen, A. (Eds), *Entrepreneurship and SME Research: On its Way to the Next Millennium*, Ashgate, Aldershot, pp. 190-216.

Edmunds, S.W. (1979), "Performance measures for small business", *Harvard Business Review*, January/February, pp. 172-6.

Ellinger, A.E., Daugherty, P.J. and Keller, S.B. (2000), "The relationship between marketing/logistics interdepartmental integration and performance in US manufacturing firms: an empirical study", *Journal of Business Logistics*, Vol. 21 No. 1, pp. 1-22.

Emerson, R.M. (1962), "Power-dependence relations", *American Sociological Review*, Vol. 27 No. 1, pp. 31-41.

European Commission (2003), "SME definition", available at: http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm

European Logistics Association and A.T. Kearney (2004), "Differentiation for performance: results of the fifth quinquennial European logistics study", *Excellence in Logistics 2003/2004*, European Logistics Association, Hamburg.

Evans, D.S. (1987a), "Tests of alternative theories of firm growth", *Journal of Political Economy*, Vol. 95 No. 4, pp. 657-74.

Evans, D.S. (1987b), "The relationship between firm growth, size and age: estimates for 100 manufacturing industries", *The Journal of Industrial Economics*, Vol. 35 No. 4, pp. 567-81.

Fawcett, S.E. and Cooper, M.B. (1998), "Logistics performance measurement and customer success", *Industrial Marketing Management*, Vol. 27 No. 4, pp. 341-57.

Filbeck, G., Gorman, R., Greenlee, T. and Speh, T. (2005), "The stock price reaction to supply chain management advertisements and company value", *Journal of Business Logistics*, Vol. 26 No. 1, pp. 199-216.

Garnsey, E., Stam, E., Heffernan, P. and Hugo, O. (2003), "New firm growth: exploring processes and paths", ERIM Report Series Research in Management, Rotterdam.

Gartner, W.B. (1985), "A conceptual framework for describing the phenomenon of new venture creation", *Academy of Management Review*, Vol. 10 No. 4, pp. 696-706.

Gilmour, P. (1999), "Benchmarking supply chain operations", *International Journal of Physical Distribution & Logistics Management*, Vol. 29 No. 4, pp. 259-66.

Global Logistics Research Team, Michigan State University (1995), *World Class Logistics: The Challenge of Managing Continuous Change*, Council of Logistics Management, Oak Brook, IL.

Gunasekaran, A., Patel, C. and McGaughey, R.E. (2004), "A framework for supply chain performance measurement", *International Journal of Production Economics*, Vol. 87 No. 3, pp. 333-47.

Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001), "Performance measures and metrics in a supply chain environment", *International Journal of Operations and Production Management*, Vol. 21 Nos 1/2, pp. 71-87.

Kadiyali, V., Chintagunta, P. and Vilcassim, N. (2000), "Manufacturer-retailer channel interactions and implications for channel power: an empirical investigation of pricing in a local market", *Marketing Science*, Vol. 19 No. 2, pp. 127-48.

Korpela, J. and Tuominen, M. (1996), "Benchmarking logistics performance with an application of the analytic hierarchy process", *IEEE Transactions on Engineering Management*, Vol. 43 No. 3, pp. 323-33.

Kremers, L., Paul, J. and Chuan, L.Y. (2005), "2005 annual supply chain benchmark study of Southeast Asia", available at: www.supply-chain.org/galleries/default-file/Executive%20Summary%20Report%20-%202005%20Annual%20Supply%20Chain%20Benchmark%20Study%20for%20Southeast%20Asia%20(2).pdf

Lai, K-H. and Cheng, T.C.E. (2003), "Supply chain performance in transport logistics: an assessment by service providers", *International Journal of Logistics: Research and Applications*, Vol. 6 No. 3, pp. 151-64.

Lambert, D.M. and Burduroglu, R. (2000), "Measuring and selling the value of logistics", *International Journal of Logistics Management*, Vol. 11 No. 1, pp. 1-17.

Lambert, D.M. and Pohlen, T.L. (2001), "Supply chain metrics", *International Journal of Logistics Management*, Vol. 12 No. 1, pp. 1-19.

Larson, P.D., Poist, R.F. and Halldósson, Á. (2007), "Perspectives on logistics vs. supply chain management", *Journal of Business Logistics*, Vol. 28 No. 1, pp. 1-24.

Morgan, C. (2004), "Structure, speed and salience: performance measurement in the supply chain", *Business Process Management Journal*, Vol. 10 No. 5, pp. 522-36.

Naula, T., Ojala, L. and Solakivi, T. (2006), *Finland – State of Logistics 2006, Publications of the Ministry of Transport and Communications Finland 45/2006*, Edita Publishing, Helsinki, available at: www.tukkk.fi/markkinointi/log/LS/en/ls.htm

OECD (2006), *Infrastructure to 2030; Telecom, Land Transport, Water and Electricity*, OECD, Paris.

Olavarrieta, S. and Ellinger, A.E. (1997), "Resource-based theory and strategic logistics research", *International Journal of Physical Distribution and Logistics Management*, Vol. 27 Nos 9/10, pp. 559-87.

Porter, M.E. (1980), *Competitive Strategy: Techniques for Analysing Industries and Competitors*, The Free Press, New York, NY.

Rosenweig, E.D., Roth, A.V. and Dean, J.W. Jr (2003), "The influence of an integration strategy on competitive capabilities and business performance: an exploratory study of consumer products manufacturers", *Journal of Operations Management*, Vol. 21 No. 4, pp. 437-56.

Rushton, A., Croucher, P. and Baker, P. (2006), *The Handbook of Logistics and Distribution Management*, 3rd ed., Kogan Page, London.

Sanders, N.R. and Premus, R. (2005), "Modeling the relationship between firm IT capability, collaboration, and performance", *Journal of Business Logistics*, Vol. 26 No. 1, pp. 1-23.

Schramm-Klein, H. and Morschett, D. (2006), "The relationship between marketing performance, logistics performance and company performance for retail companies", *International Review of Retail, Distribution and Consumer Research*, Vol. 16 No. 2, pp. 277-96.

Shang, K. and Marlow, P.B. (2005), "Logistics capability and performance in Taiwan's major manufacturing firms", *Transportation Research Part E*, Vol. 41 No. 3, pp. 217-34.

Singhal, V.R. and Hendricks, K.B. (2002), "How supply chain glitches torpedo shareholder value", *Supply Chain Management Review*, Vol. 6 No. 1, pp. 18-33.

Stank, T.P., Keller, S.B. and Daugherty, P.J. (2001), "Supply chain collaboration and logistical service performance", *Journal of Business Logistics*, Vol. 22 No. 1, pp. 29-48.

Statistics Finland (2007), GDP, population, firm and trade data available at a public domain site at: www.tilastokeskus.fi (accessed October 2007).

Stewart, B.G. III (2004), "Champions of profitable growth", *Harvard Business Review*, Vol. 82 Nos 7/8, pp. 59-63.

Stigler, G.J. (1968), *The Organization of Industry*, Irwin, Homewood, IL.

van Landeghem, R. and Persoons, K. (2001), "Benchmarking of logistical operations based on a causal model", *International Journal of Operations and Production Management*, Vol. 21 Nos 1/2, pp. 254-66.

Venkatraman, N. and Ramanujam, V. (1986), "Measurement of business performance in strategy research: a comparison of approaches", *Academy of Management Review*, Vol. 11 No. 4, pp. 801-14.

Walters, D. (1999), "The implications of shareholder value planning and management for logistics decision making", *International Journal of Physical Distribution and Logistics Management*, Vol. 29 No. 4, pp. 240-58.

Weinzimmer, L.G., Nystrom, P.C. and Freeman, S.J. (1998), "Measuring organisational growth: issues, consequences and guidelines", *Journal of Management*, Vol. 24 No. 2, pp. 235-62.

Wilkinson, I.F. (1996), "Distribution channel management: power considerations", *International Journal of Physical Distribution & Logistics Management*, Vol. 26 No. 5, pp. 31-41.

Wu, F., Yeniyurt, S., Kim, D. and Cavusgil, S.T. (2006), "The impact of information technology on supply chain capabilities and firm performance: a resource-based view", *Industrial Marketing Management*, Vol. 35 No. 4, pp. 493-504.

Yusuf, Y.Y., Gunasekaran, A., Adeleye, E.O. and Sivayoganathan, K. (2004), "Agile supply chain capabilities: determinants of competitive advantage", *European Journal of Operational Research*, Vol. 159 No. 2, pp. 379-92.

Appendix 1. Comparison of top performers and their peers

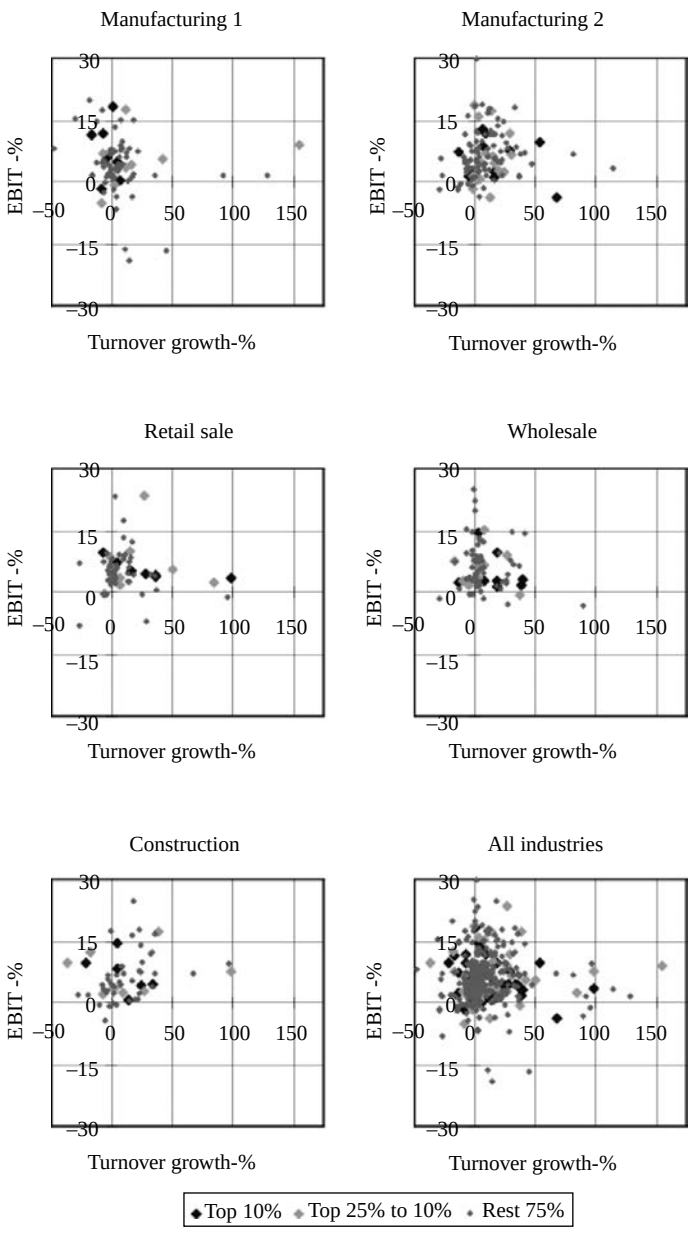


Figure A1.

EBIT-% = Earnings before interest and taxes as percentage from turnover

Appendix 2. Rotated factor matrix of the dimensions of logistics performance

	Logistics costs	Operational metrics	Service level
S1	−0.1716	−0.0188	*0.7008*
S2	−0.1675	0.1268	*−0.2450*
T1	0.1190	*0.3147*	0.0041
T2	−0.0645	*0.6488*	−0.0172
T3	0.0728	*0.5657*	−0.2228
C1	*0.2862*	0.1694	−0.0048
C2	*0.7625*	0.1322	0.0682
C3	*0.5607*	−0.0291	−0.0420
C4	*0.5333*	0.0173	−0.0411

Notes: Extraction method: principal axis factoring; rotation method: varimax with Kaiser normalization

Table AI.

Appendix 3. Medians of average financial ratios from 2002 to 2004

	Annual turnover growth (per cent)	Annual growth of assets (per cent)	Median ROCE-per cent; 2002, 2003 and 2004	Median ROA-per cent; 2002, 2003 and 2004	Median EBIT-per cent; 2002, 2003 and 2004
Manufacturing industry group 1					
Top-10 per cent	−4.12	−1.64	15.04	8.8	5.48
Rest-90 per cent	5.49	0.13	15.11	6.64	4.42
Sig.	0.043*	0.795	0.888	0.579	0.487
Manufacturing industry group 2					
Top-10 per cent	7.97	7.56	21.67	8.64	4.87
Rest-90 per cent	9.21	4.02	16.23	7.06	5.27
Sig.	0.9432	0.6026	0.3970	0.9253	0.6031
Construction					
Top-10 per cent	9.16	4.25	22.50	10.13	6.41
Rest-90 per cent	9.47	8.65	26.16	13.26	4.79
Sig. 10-90 per cent	0.8845	0.6281	0.4103	0.6564	0.5741
Retail sale					
Top-10 per cent	27.48	11.96	42.67	16.49	4.33
Worst-90 per cent	5.44	6.37	23.22	12.36	4.45
Sig. 10-90 per cent	0.0762	0.2670	0.2226	0.1173	0.6810
Wholesale					
Top-10 per cent	18.46	13.16	30.04	7.46	2.83
Worst-90 per cent	5.15	6.01	23.55	13.30	5.96
Sig. 10-90 per cent	0.3186	0.0762	0.0733	0.3294	0.8549

Note: *Difference is significant at the 0.05 level (two-tailed)

Table AII.

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Juuso Töyli, DSc (Economics and Business Administration), DSc (Tech.), is Acting Professor of logistics at Helsinki School of Economics. Earlier he has served as Professor and post-doctoral researcher at Turku School of Economics as well as senior researcher at

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Lauri Ojala, DSc (Economics and Business Administration), is a full tenured Professor of Logistics at the Turku School of Economics, Finland. His research interest include international logistics and transport markets. He has also worked as an expert for several international agencies in transport and logistics development projects in, for example, The Baltic States and CIS countries. In 2006-2007, he heads two large EU part-funded projects; DaGoB on transport of Dangerous Goods (www.dagob.info) and LogOn Baltic on logistics and ICT competence (www.logonbaltic.info).

Tapio Naula, MSc (Economics and Business Administration), is a researcher and independent consultant in logistics after having made a career in logistics industry. His special areas of expertise include trade logistics and transport facilitation issues in former Soviet Union countries, especially in the Baltic States and Central Asia. He has also worked as an independent expert for the World Bank, UNIDO and the GTZ.