



Logistics outsourcing and company performance of SMEs

Evidence from 223 firms operating in Finland

Logistics outsourcing of SMEs

131

Tomi Solakivi and Juuso Töyli

Logistics, Turku School of Economics, University of Turku, Turku, Finland

Janne Engblom

Quantitative Methods in Management, Turku School of Economics, University of Turku, Turku, Finland, and

Lauri Ojala

Logistics, Turku School of Economics, University of Turku, Turku, Finland

Abstract

Purpose – The purpose of this paper is to explore the current state of and future expectations concerning the usage of the outsourcing of logistics operations in small- and medium-sized enterprises (SMEs), and to analyse and quantify the relationships between logistics outsourcing, costs and performance, financial performance, and the company context.

Design/methodology/approach – The data were 223 manufacturing and trading SMEs from the Finnish logistics survey combined with detailed financial report-based data, both referring to the year 2008. Statistical analyses including ANOVA and factor analysis were applied.

Findings – Transport activities are excessively outsourced. Most companies report no outsourcing of order processing and invoicing, and half of them have not outsourced logistics IT systems. Outsourcing is expected to grow in all areas with strongest expectations in materials management, value-added services, and in IT. The logistics costs for companies engaging in the medium level of outsourcing could be higher than those of other companies. Further research is needed to confirm this finding. No loss or gain in logistics performance due to outsourcing was observed. The more the companies are engaged in outsourcing, the more they monitor as well as collaborate internally and externally, or vice versa. In general, the results imply that management should not expect automatic gains from logistics outsourcing, and should rather analyse the company-specific characteristics that support or in some cases suffer from the outsourcing decision.

Originality/value – The article explores logistics outsourcing in SMEs combining financial report data with self-reported measures. It analyses and quantifies the relationship of logistics outsourcing to logistics costs, financial performance, logistics performance, and company context.

Keywords Logistics outsourcing, Company performance, Small to medium-sized enterprises, Finland

Paper type Research paper

1. Introduction

Outsourcing in general is widely used by firms in order to enhance their performance and agility, and to cut costs related to their operations. Almost two decades ago, Bettis *et al.* (1992) presented arguments both for and against outsourcing, concluding that, “properly understood and managed as an overall part of strategy, outsourcing

The Foundation for Economic Education (Finland) has supported this research undertaking, which is gratefully acknowledged.



Strategic Outsourcing: An
International Journal
Vol. 4 No. 2, 2011
pp. 131-151

© Emerald Group Publishing Limited
1753-8297
DOI 10.1108/17538291111147982

can aid competitiveness". Aertsen assessed the benefits of outsourcing the physical distribution function in 1993 (Aertsen, 1993), and D'Aveni and Ravenscraft (1994) argue that outsourcing companies often achieve cost advantages relative to vertically integrated firms. A sharper focus on core competences is another benefit commonly combined with outsourcing (D'Aveni and Ravenscraft, 1994; Gilley and Rasheed, 2000). Kotabe and Mol (2009) studied the relationship between outsourcing and financial performance, concluding that there was an optimal level of outsourcing and that deviations would be costly. Outsourcing has also many disadvantages, including deterioration in overall performance due to excess reliance on outside suppliers (Bettis *et al.*, 1992) and the lower innovation capability of the outsourcer (Gilley and Rasheed, 2000).

Logistics outsourcing is relevant to the discussion on outsourcing in general. For two decades, studies have focused on the questions: "What logistics activities have been outsourced?" "To what extent?" and "Why or why not?". For example, Bardi and Tracey (1991) studied the level of transportation outsourcing in the USA, La Londe and Maltz (1992) surveyed the outsourcing of warehousing and attitudes towards outsourcing in the USA, Daugherty *et al.* (1996) concentrated on third-party providers of logistics services, and Gooley (1997), Andersson (1997) and Van Laarhoven *et al.* (2000) conducted surveys on the level and motives of logistics outsourcing in Europe. On the geographical level, similar kinds of research questions have been addressed all over the world (see, e.g. Bolumole (2001) on convenience goods in the UK, Bhatnagar *et al.* (1999) on logistics outsourcing in Singapore, Beaumont and Sohal (2004) on Australia, Wilding and Juriado (2004) on Europe, Sohail *et al.* (2004) on Ghana, and Arroyo *et al.* (2006) on Mexico and comparison with European and US results).

There are also two recent studies (Hilletoft and Hilmola, 2010; Juntunen *et al.*, 2010) about different aspect of outsourcing in Finnish companies. Both of these studies focus on the larger companies and on the relationship between outsourcing and supply chain strategy or outsourcing relationships.

Complementing the above-mentioned one-off studies, there is a growing body of sequential research. Lieb and Randall (1996) were the first to conduct an outsourcing-related survey, which they did in 1991 (see also Penske Logistics 3PL Study) and have been repeating it annually since then. The largest study, both geographically and industry wise, is the Cap-Gemini 3PL Study carried out by Langley *et al.*, which has been repeated 15 times and covers the state of logistics outsourcing in all continents (Langley and Capgemini, 2010). Ashenbaum *et al.* (2005), in turn, evaluated the comparability of these sequential studies and concluded that more in-depth methodology would be needed in order to make the results fully comparable and useful.

There are a few general conclusions to be drawn from the growing body of research related to logistics outsourcing. First, outsourcing in general, as in logistics operations, has been increasing steadily over the years. Second, the scope of logistics outsourcing has extended from individual services, originally mainly transportation, to warehousing and, to a more limited extent, more complex services and service packages. Finally, outsourcing is more common in developed than in developing economies. Thus, most of the previous research has concentrated on "what", "to what extent" and "why" questions. Although the potential positive and negative effects of outsourcing in general have been known for decades, and tested in various studies, empirical testing within the narrower scope of logistics is limited.

The purpose of this article is, first, to explore the current state of and future expectations concerning the usage of the outsourcing of logistics operations in small- and medium-sized manufacturing and trading enterprises (SMEs) operating in Finland, and second to analyse and quantify the relationships between logistics outsourcing, costs and performance, financial performance and the company context.

The logistics practices applied in the separate business units of larger enterprises may differ considerably, consolidated financial reports are typically too aggregated for meaningful analysis, and comprehensive business-unit-level data are rarely available. These problems are less pronounced in SMEs. Furthermore, SMEs, including micro-sized companies, comprise over 99 per cent of the 320,952 registered firms in Finland (Statistics Finland, 2009), as in the European Commission (EU) in general (EC, 2003), and accounted for 48.7 per cent of the combined turnover of all firms in the year 2000 (Statistics Finland, 2009).

The data were collected from Finland because of an exceptionally good availability of survey and related financial-reporting-based data of unlisted firms. Finland is a highly industrialised open economy, and was sixth in the World Economic Forum's Global Competitiveness Index in 2007-2008 and 2008-2009. The logistics environment is well developed, as indicated in the Logistics Performance Index: Finland was in the top 10 per cent in both 2007 and 2010 (Arvis *et al.*, 2007, 2010). The logistics costs of Finnish firms are, on average, at the same level, as those of comparable firms in Northern Germany and Central Sweden (Ojala *et al.*, 2007). With a population of 5.2 million, Finland ranks among the 12 richest countries in the world (the survey year 2008 GDP/capita as a measure).

The rest of the article is structured as follows: Section 2 describes the research design, Section 3 presents the findings, and Section 4 comprises the concluding discussion.

2. Research design

2.1 Research questions

Figure 1 shows the research framework and the related questions addressed in this article. The framework is built around logistics outsourcing and the first aim is "to determine the current state of and future expectations concerning the outsourcing

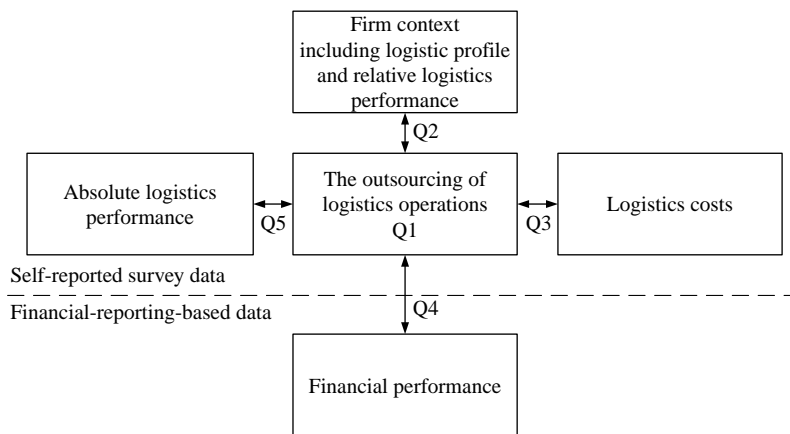


Figure 1. Research framework

of logistics operations in SMEs operating in Finland". This part of the research is descriptive and resembles previous studies that typically address questions such as "What logistics activities have been outsourced?" and "To what extent?"

Research question 2 concerns "the connection, if any, between the logistics context and outsourcing". Perhaps, the firm's operating environment and capabilities as well as the competitive situation affect findings concerning logistics outsourcing. The following dimensions were identified in order to study these effects:

- relative logistics performance compared to the closest competitors;
- performance monitoring;
- the strategic importance of logistics to the firm;
- internal and external collaboration;
- the production mode; and
- the level of internationalisation.

Research question 3 concerns "the connection, if any, between logistics costs and logistics outsourcing". According to the research, one of the most common motives for outsourcing is to lower the costs of or control expenditure on logistics (Van Laarhoven *et al.*, 2000; Beaumont and Sohal, 2004; Arroyo *et al.*, 2006).

Research question 4 concerns "the connection, if any, between outsourcing and the firm's absolute logistics performance". This is related to Q2 and Q3, and follows the same logic, but unlike Q2 focuses on absolute rather than relative performance metrics. Logistics performance and costs could be considered similar types of measures, the conclusion being that outsourcing should also have an effect on performance. However, it should be noted that an outsourced operation could also be more transparent with regard to possible problems.

Research question 5 concerns "the connection, if any, between logistics outsourcing and the firm's financial performance". One of the motives for outsourcing logistics operations is to allow the company to focus more on its core activities thereby, according to, D'Aveni and Ravenscraft (1994) and Gilley and Rasheed (2000), for example, leading to improved financial performance. Kotabe and Mol (2009) also found a curvilinear relationship between outsourcing and financial performance on a general level and not just in logistics operations.

2.2 Construct measurement

The company context included the industry, production mode, level of internationalisation, and relative logistics performance compared to that of the closest competitor, and the four main elements of the logistics profile in Töyli *et al.* (2008). Relative performance and each element of the profile were assessed on between three and six questionnaire items that were subjected to explorative factor analysis whose rotated solution shown in Appendix 1. Five new variables were formed by calculating the sums of top loading variables. The new variables and their Cronbach's α are shown in Table I.

The respondents representing manufacturing organisations were asked to report the main production mode in use in their company. Five options were given: make to stock, make to order, assembly to order, engineer to order, and capacity selling.

The level of internationalisation was defined according to the self-reported division of company sales and production into different geographical areas, broken down into three groups for the analysis. Domestic companies were defined as those with at least 90 per cent of sales in domestic markets, Export companies as those with at least 10 per cent of sales outside domestic markets, and international companies as those with at least 10 per cent of sales outside the domestic market and some production facilities abroad. The results presented are not sensitive to the exact grouping criterion.

In order to measure absolute logistics performance, we asked the respondents to provide information on a set of various key related figures:

- the percentage of orders with some kind of error in the documentation;
- the perfect-order-fulfilment rate;
- the order-delivery time in days;
- the time in days that materials were in the possession of the company (inventory days of supply);
- the average payment time in the company in days (days of payables outstanding); and
- the average payment time among the customers in days (days of sales outstanding).

Performance metrics 1, 2, 5, and 6 could be regarded system independent variables, whereas metrics 3 and 4 are notably influenced at least by the production and the supply chain context. Therefore, the findings from metrics 3 and 4 should be interpreted cautiously at the level of our analysis.

Logistics costs were measured according to respondent estimates in six different categories: transportation, warehousing, inventory carrying, logistics administration, transport packing, and other logistics costs as a proportion of company turnover that, according to Stewart (1995), is a robust base for analysis. The logistics cost estimates were collected at one-percentage point intervals.

Financial performance metrics comprised:

- the return on total assets (ROA) in the year 2008;
- the return on capital employed (ROCE) in the year 2008; and
- the earnings before interest and taxes percentage (EBIT%) in the year 2008.

EBIT% was included in order to check whether profitability behaved differently compared to asset-based measures.

Level of logistics outsourcing was measured by asking the respondents to evaluate the magnitude of the outsourcing of the operations listed in Table II on a five-point

	Variable	Cronbach's α
Relative logistics performance	RELATIVE	0.864
Monitoring of logistics performance	MONITORING	0.838
Strategic importance of logistics	SIGNIFICANCE	0.853
Internal collaboration	INTERNAL	0.824
External collaboration	EXTERNAL	0.785

Table I.
Measures of
relative logistics
performance and the
elements of the
logistics profile

scale with alternatives at 25 percentage-point intervals. This operationalisation resembles the one that has been applied in several sequential studies since Langley (1996). The operations were further grouped into “Transportation services”, “Materials management and information-related services”, and “Information processing”. In order to check the feasibility of the grouping, all the activities were factored (Appendix 2). Two factors were extracted using the unit eigenvalue as a criterion. All “transportation services” loaded strongly onto the second rotated factor, and all the rest onto the first factor. However, given the conceptual difference between the information-processing and materials-management groups, they were kept separate in the further analyses.

Within outsourcing groups, the companies were divided into three groups based on the highest estimate of outsourced operation. We labelled: “No outsourcing”, which included the companies that had not outsourced any of the activities, “Moderate outsourcers”, comprising the companies with a maximum outsourcing of less than 50 per cent on any of the activities, and “Heavy outsourcers”, including those with a maximum outsourcing of more than 50 per cent on any of the activities. Our conclusions are not sensitive to the exact grouping criteria.

2.3 Dataset

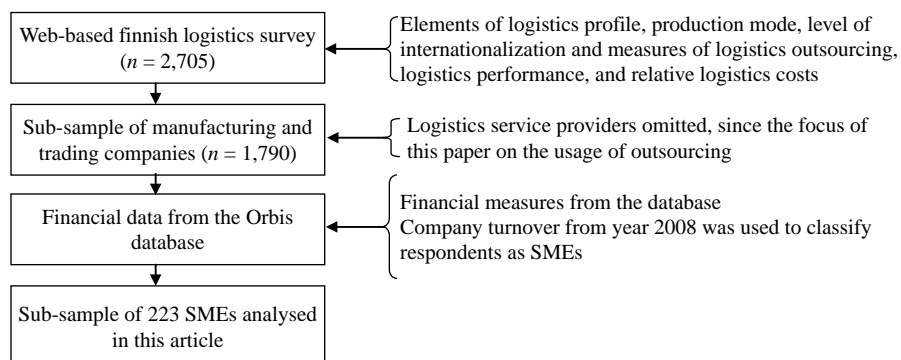
The empirical data analysed in this article comprised a sub-sample from the Finnish logistics survey data of Solakivi *et al.* (2009) combined with detailed financial data extracted from the Orbis database, both referring to year 2008. The sub-sample included all 223 manufacturing and trading companies fulfilling EC’s criteria on SMEs on which financial data were available for the year 2008. SME is an enterprise with ten to 250 employees and either an annual turnover between 2 and 50 million euros, or an annual balance sheet between 2 and 43 million euros. The 2008 financial data (turnover and balance sheet) and the self-reported survey data (employee count) were used to determine whether or not a company qualified as an SME. The target group of the Finnish logistics survey also included the micro-sized and large companies, but for the purposes of this article, the respondents not qualifying the definition of SME were omitted from the data. Also, since the focus of this article is on the demand side of the outsourcing decision, the manufacturing and trading companies were only included in the analysed sample. The logistics service providers were considered more as the supply side of outsourcing and thus omitted from the analysis (Figure 2).

The logistics survey data were gathered by means of a web-based questionnaire during the period from October to December in 2008. An invitation to participate with a unique link to the questionnaire was sent to the 26,311 personal email addresses of all non-student members of the Finnish Association of Purchasing and Logistics (LOGY), Finnish Transport and Logistics (SKAL), and the members of the Federation of Finnish Enterprises and Regional Chambers of Commerce in the industries covered

Table II.
Logistics operations
within the outsourcing
groups

Transportation services	Information processing	Materials management and value-added services
Domestic transportation	Order processing	Warehousing
International transportation	Invoicing	Inventory management
Reverse logistics	Logistics IT	Product customisation
Freight forwarding		

Figure 2. Data sources and procedures used in the study



in the survey. The responses were not anonymous in that each respondent was identified by a unique link that also allowed the combination of the survey and financial data. If more than one response were received from the same company, the most complete, i.e. the one with least empty questions, was chosen. If there were identically complete responses, the one received first was chosen. In this data, there were a total of six double responses that were omitted from the sample.

In total, 2,705 responses were received, a response rate of 13.9 per cent. Of these, 37 per cent ($n = 996$) represented manufacturing (including construction), 29 per cent ($n = 794$) trading companies, and 34 per cent ($n = 915$) logistics companies.

3. Findings

3.1 Current state and future expectations

The results concerning the extent of logistics outsourcing in Finnish companies are depicted in Table III. Transportation seems to be the most commonly outsourced operation: around 90 per cent (87.3 per cent domestic and 92.1 per cent international) of the respondents had outsourced 75 per cent or more, and less than 5 per cent did not outsource any. Other commonly outsourced activities included reverse logistics and freight forwarding – to a level of 75 per cent or more by almost 80 per cent of the companies in the sample. The common denominator in this extensive outsourcing of logistics operations is that they are all transport or closely related activities. On the international level, the outsourcing of transport activities seems to be as extensive as in most developed countries (Langley *et al.*, 2005; Langley and Capgemini, 2010).

Second, about 50 per cent of the companies reported zero outsourcing of logistics IT, and the other 50 per cent had outsourced the operation at least to some extent. In fact, some 24 per cent of the companies had outsourced the majority, i.e. more than 50 per cent, of the function. In terms of order processing and invoicing, the vast majority – some 80 per cent of the companies had not outsourced any of the operations and only a small fraction, between 5 and 6 per cent, had outsourced over 50 per cent.

The findings related to materials management and value-added services were somewhat mixed in that warehousing and product customisation were, at least to some extent, more likely to be outsourced. The level of warehousing-related outsourcing would seem to be on a significantly low level compared to other high-income countries (Langley *et al.*, 2005).

Outsourcing group and corresponding logistics operations	No outsourcing ^a (0)	Moderate outsourcing ^b (1-50)	Heavy outsourcing ^c (50-100)
Transportation services	0.5	7.0	92.5
Domestic transportation	1.9	10.8	87.3
International transportation	4.8	3.2	92.1
Reverse logistics	9.7	8.4	81.8
Freight forwarding	7.8	12.5	79.7
Information processing	45.5	27.7	26.7
Order processing	77.8	16.7	5.6
Invoicing	82.1	11.7	6.1
Logistics IT	51.3	24.6	24.1
Materials management and value-added services	48.8	35.5	15.8
Warehousing	61.9	24.9	13.2
Inventory management	80.9	11.3	7.7
Product customisation	68.4	24.9	6.7

Table III.
Logistics outsourcing
by operation in Finnish
SMEs

Notes: $n = 223$; all figures are percentages; ^aall the services totally within the company; ^bat least one of the services outsourced 1-50 per cent; ^cat least one of the services outsourced over 50 per cent

Given the different nature of the two main industries referred to in this article, we conducted separate analyses of the extent of outsourcing in each one. There were practically no differences between the two in most of the logistics operations. In other words, outsourcing practices would seem to be similar, regardless of the industry. Nevertheless, there was some variation. The proportion of companies outsourcing the majority (over 50 per cent) of their materials-management-related services such as warehousing and inventory management turned out to be almost twice as high among the trading companies (17.2 per cent in warehousing and 10.4 per cent in inventory management) than in the manufacturing companies (9.2 and 5.1 per cent, respectively).

Another difference between the two industries was in the outsourcing of logistics IT: almost a third (28.9 per cent) of the manufacturing companies had outsourced over 50 per cent of the operation, and only 19.1 per cent of the trading companies. Moreover, fewer trading companies than manufacturing companies had decided to handle logistics IT totally in-house (47.4 and 55.3 per cent, respectively). All other differences were negligible and not statistically significant.

The respondents were also asked to evaluate how the outsourcing would appear in 2013. Table IV shows how the two evaluations (for 2008 and 2013) compare. The negative values represent a diminishing proportion and the positive values a growing proportion in the respective cells.

It appears from Table IV that logistics outsourcing is likely to continue to increase in the coming years. More moderate growth is expected in transportation-related services, which are already widely outsourced, than in the other operations. The strongest expectations of future growth seem to be in materials management and value-added services, especially in warehousing operations. The two main industries were also analysed independently, but no major differences emerged. However, current differences in the level of outsourcing of various logistics operations seem set to remain in the future.

Outsourcing group	Logistics operation	No outsourcing ^a	Moderate outsourcing ^b	Heavy outsourcing ^c
Transportation services	Domestic transportation	-1.4	-0.5	1.8
	International transportation	-2.6	1.2	1.4
	Reverse logistics	-2.3	0.4	1.9
	Freight forwarding	-2.3	-1.0	3.3
	Order processing	-14.3	14.0	0.4
Information processing	Invoicing	-15.1	11.5	3.6
	Logistics IT	-16.6	13.5	3.2
	Warehousing	-12.5	7.4	5.1
Materials management and value-added services	Inventory management	-15.2	11.3	3.9
	Product customisation	-10.9	8.8	2.1

Table IV.
Development of logistics
outsourcing between
2008 and 2013

Notes: ^aAll the services totally within the company; ^bat least one of the services outsourced 1-50 per cent; ^cat least one of the services outsourced over 50 per cent; all figures are changes in percentage points

3.2 Company context and logistics outsourcing

The χ^2 -test of independence (PRODUCTION and INTERNATIONALISATION) and ANOVA (all other metrics) were applied to test the relationships between the different logistics outsourcing groups (“no outsourcing”, “modest outsourcing”, and “heavy outsourcing”) and the company context-related metrics introduced in Section 2.2. The results are summarised in Table V.

The non-parametric χ^2 -test of independence was used to assess the relationships between logistics outsourcing and the production mode and the level of internationalisation. This analysis is feasible only in case of manufacturing companies. The statistically significant relationships (level 0.05) identified were in the outsourcing of transportation-related operations. Furthermore, it seems from the cross-tabulation that the production mode “capacity selling” is associated with a lower level of transportation outsourcing compared to other modes, and that international companies, surprisingly, have a lower level of outsourcing than domestic and export companies.

Concerning the other metrics and both industries analysed together, the differences appeared to be in materials management and value-added services and IT. In other words, the companies with different levels of such services scored statistically differently on the MONITORING of and INTERNAL collaboration in logistics operations. There was also a similar tendency in the SIGNIFICANCE of logistics to the company, but this was less conclusive in statistical terms (0.1 level). All the statistically different scores in the more precise within-group analyses were between the “no outsourcing” and “modest outsourcing” groups.

Both main industries were also analysed separately. No statistically significant relationships were observed among the trading companies, whereas among the manufacturing companies they seemed to exist between the outsourcing of materials management and value-added services and MONITORING, SIGNIFICANCE,

Table V.
The relationships
between the company
context and logistics
outsourcing

	PRODUCTION	χ^2 -test INTERNATIONALISATION	RELATIVE MONITORING	ANOVA-test SIGNIFICANCE	INTERNAL	EXTERNAL
<i>Both industries</i>						
Transportation	n.a	**	**	*	**	
Materials management	n.a		**		**	
Logistics IT	n.a					
<i>Manufacturing</i>						
Transportation	**	*	**	**	**	*
Materials management	*					
Logistics IT						
<i>Trading</i>						
Transportation	n.a					
Materials management	n.a					
Logistics IT	n.a					

Notes: Differences within the group statistically significant at the *0.1 and **0.05 levels; n.a. – the comparison is infeasible because trading companies have no production mode

INTERNAL as well as EXTERNAL (only at the 0.1 significance level). Following more thorough analysis, it turned out that the observed differences were between the “no outsourcing” and the “modest outsourcing” groups.

The observed differences, as well as those identified in the analysis covering both industries, would indicate that companies that modestly outsource materials management and value-added services or IT-related functions monitor their logistics operations more thoroughly than the ones that have not outsourced these functions at all. The same applies to the strategic significance of logistics to the company as well as to internal and external collaboration in logistics operations.

3.3 Logistics costs and logistics outsourcing

The search for possible relationships between the outsourcing of logistics and logistics costs started from the most aggregate level, i.e. total logistics costs and all companies, and then each cost component and main industry were analysed separately. Table VI shows the total division and the level of logistics costs in the sample (14.6 per cent of total sales). The cost components with the largest shares were transportation (4.2 per cent of sales) and inventory carrying (4.0 per cent). None of the cost means or medians is statistically significantly different between the main industries. The logistics costs were measured as a self-reported proportion of company turnover that, according to Stewart (1995), is a robust base for analysis.

Logistics costs were subjected to explorative factor analysis (Appendix 3). Four of the cost components (transportation, warehousing, inventory carrying, and logistics outsourcing) formed one factor and the other two (transportation packing and indirect costs) formed the other. It thus seems that costs that are more directly linked to the operational activity of the company, and thus more concrete, behave in a similar manner as the two more abstractly defined costs.

Analysis of both main industries together and the total logistics costs gives the overall impression that the relationship between outsourcing and costs slightly resembles an inverse U-shaped curve. Logistics costs measured on the overall level as well as separately in terms of individual components, seem to be slightly lower if the company has made the decision not to outsource logistics activities at all, or to outsource more than half of them. The results follow the same pattern for the outsourcing of both materials management and value-added services, as well as of information processing. Given only single respondent in the “no outsourcers” group in the transportation-services group, the analysis just involved comparing the two remaining groups with each other. These quite systematic and visually identifiable differences turned out to be statistically insignificant ($p > 0.05$).

	Percentage of sales	Percentage of logistics costs
Transportation costs	4.2	28.9
Warehousing costs	3.0	20.9
Inventory-carrying costs	4.0	28.0
Logistics administration	1.2	8.3
Transportation packing	1.2	7.2
Other logistics costs	1.0	6.7
Total	14.6	100.0

Table VI.
The level and division
of logistics costs
in the sample

Table VII shows the group-wise comparisons of the two cost factors, as well as the total costs of trading companies. It turned out that the “modest outsourcers” faced somewhat higher costs, excluding transport services, than the companies with no outsourcing at all and those with heavy outsourcing. The same applied to most of the comparisons within the manufacturing industry. However, all differences turned out to be statistically insignificant ($p > 0.05$).

Given the dominant role of transportation and inventory-carrying costs, each of the cost components was subjected to the same analyses separately. However, no statistically significant patterns were observed.

3.4 Logistics outsourcing and absolute logistics performance

The next phase of the analysis was to explore the possible relationships between logistics outsourcing and the level of logistics performance. The first step was to analyse the level of logistics performance with different levels of outsourcing in the two main industries combined, and the next was to compare the differences in performance between the two main industries and finally carry out within industry analyses. All analyses were done by means of ANOVA testing the means and the non-parametric Kruskal-Wallis test testing the medians.

Table VIII shows the median values of logistics performance in relation to the outsourcing of materials management and value-added services. Similar analyses were

		Mean	Median	SD
<i>Transportation services</i>				
Cost factor 1	Modest outsourcing	10.50	10.50	4.95
	Heavy outsourcing	12.54	11.00	7.92
Cost factor 2	Modest outsourcing	1.00	1.00	1.41
	Heavy outsourcing	1.72	1.00	1.98
Total logistics costs	Modest outsourcing	11.50	11.50	3.54
	Heavy outsourcing	14.26	13.00	8.58
<i>Information services</i>				
Cost factor 1	No outsourcing	12.24	11.50	7.88
	Modest outsourcing	13.86	11.00	7.98
	Heavy outsourcing	11.09	10.00	7.54
Cost factor 2	No outsourcing	1.71	1.00	2.01
	Modest outsourcing	1.36	1.50	0.95
	Heavy outsourcing	2.36	1.00	3.01
Total logistics costs	No outsourcing	13.95	13.00	8.71
	Modest outsourcing	15.23	13.00	8.28
	Heavy outsourcing	13.45	13.00	8.47
<i>Materials management and value-added services</i>				
Cost factor 1	No outsourcing	12.48	12.00	7.84
	Modest outsourcing	13.71	11.00	9.14
	Heavy outsourcing	11.76	10.00	6.82
Cost factor 2	No outsourcing	1.88	1.00	2.36
	Modest outsourcing	1.94	2.00	1.78
	Heavy outsourcing	1.24	1.00	1.26
Total logistics costs	No outsourcing	14.36	14.00	8.80
	Modest outsourcing	15.65	13.00	9.66
	Heavy outsourcing	13.00	13.00	6.91

Table VII.
Logistics costs
and the outsourcing in
trading companies

	Both industries			Manufacturing			Trading		
	Median	SD	Skewness	Median	SD	Skewness	Median	SD	Skewness
<i>Share of deliveries with errors in documentation in the outsourcing groups</i>									
None	2.00	7.83	5.01	2.00	6.00	2.57	2.00	9.33	5.52
Moderate	3.00	10.26	3.61	3.00	4.60	1.82	3.00	14.57	2.62
Heavy	2.00	14.93	5.28	2.00	3.94	3.70	2.25	19.38	4.08
<i>Perfect order-fulfilment rate in the outsourcing groups</i>									
None	95.00	14.08	-2.86	95.00	16.49	-2.83	95.00	10.66	-2.18
Moderate	95.00	6.75	-1.63	95.00	6.78	-1.82	95.00	6.88	-1.50
Heavy	95.00	13.20	-3.92	95.00	6.97	-1.61	95.00	16.53	-3.44
<i>Average delivery time (in days) * in the outsourcing groups</i>									
None	7.00	29.04	1.98	14.00	30.01	1.79	4.00	27.83	2.23
Moderate	3.00	23.01	2.34	10.00	27.73	1.68	2.00	8.61	2.42
Heavy	5.00	71.42	3.82	15.00	98.93	2.69	3.00	30.32	4.24
<i>Inventory days of supply in the outsourcing groups</i>									
None	30.00	48.64	2.33	32.50	51.38	2.30	30.00	44.37	2.56
Moderate	30.00	50.21	1.30	30.00	49.29	1.66	45.00	52.45	0.96
Heavy	30.00	41.30	1.32	45.00	48.14	0.94	25.00	31.59	1.46
<i>Days of sales outstanding * in the outsourcing groups</i>									
None	30.00	17.23	2.25	30.00	14.33	2.96	25.00	19.54	2.14
Moderate	30.00	18.05	1.83	30.00	19.91	1.65	18.00	11.67	1.70
Heavy	30.00	13.03	0.88	30.00	13.64	0.52	20.00	8.24	0.12
<i>Days of payables outstanding in the outsourcing groups</i>									
None	30.00	12.69	0.77	30.00	10.84	0.94	30.00	14.48	0.64
Moderate	30.00	14.31	0.66	30.00	12.54	0.43	30.00	16.55	0.70
Heavy	30.00	13.41	0.43	30.00	11.44	0.60	29.00	14.76	0.53

Note: The difference between industries is significant at the *0.05 level

Table VIII.
Descriptive statistics for
the measures of logistics
performance related to
the outsourcing of
materials management
and value-added services

carried out for all of the outsourcing groups with similar outcomes. There were no identifiable relationships in any of the outsourcing groups regardless of whether the variables were analysed in combination or separately in the two industries. The only statistically significant differences are in days of sales outstanding and in average delivery time between the two main industries. Since the outsourcing behaviours of the two main industries closely resemble one another, it is likely that these differences are caused by the different natures of the two industries, rather than outsourcing.

3.5 Logistics outsourcing and financial performance

The final phase of the analysis was to test for a possible relationship between logistics outsourcing and overall financial performance. Appendix 4 shows a summary of financials performance metrics used. All the profitability metrics (average EBIT percentage (EBIT%), average ROA, and average ROCE correlated significantly.

ROA and ROCE suggest in some cases a non-linear, inverse U-shaped relationship and EBIT% negative relationship between the outsourcing of information processing and of financial performance. No identifiable patterns were observed for the other two operations – transportation-related services and materials management and value-added services. Despite the rather large absolute differences between the mean ROA, ROCE, and EBIT percentage values in the different classes of logistics outsourcing, they were not statistically significant. These results are depicted in Table IX.

Table IX.
Financial performance
and the level of
information-processing
outsourcing

	Both industries		Manufacturing		Trade	
	Mean	Median	Mean	Median	Mean	Median
<i>ROA</i>						
No outsourcing	12.93	10.96	14.96	11.08	10.55	8.03
Moderate outsourcing	13.74	12.75	12.37	7.11	15.56	13.92
Heavy outsourcing	7.67	6.63	5.63	4.68	9.30	9.50
<i>ROCE</i>						
No outsourcing	27.43	23.41	27.04	21.03	27.89	24.24
Moderate outsourcing	29.06	24.68	24.95	21.81	34.54	27.75
Heavy outsourcing	22.76	14.32	10.50	10.49	32.58	14.68
<i>EBIT%</i>						
No outsourcing	7.08	5.78	7.99	6.13	6.03	4.36
Moderate outsourcing	6.66	5.32	7.61	5.54	5.38	5.17
Heavy outsourcing	4.40	3.88	5.67	4.11	3.39	3.88

4. Discussion and conclusions

Finnish small- and medium-sized manufacturing and trading companies appear to outsource their logistics operations to roughly the same extent as in most developed countries. Both domestic and international transportation, freight forwarding and reverse logistics are widely outsourced: about 80 per cent of companies outsource most of their transportation-related activities. The largest individual component of logistics costs is, in fact, transportation, the implication being that these companies have outsourced the biggest cost-generating item of their logistics operations.

Other logistics operations were less widely outsourced in our sample. Especially, most of the logistics operations related to materials and information exchange are still carried out in-house. However, it seems that the extent of outsourcing of these functions will increase in the future. The companies included in the sample estimated that every logistics operation covered in the study would be outsourced to a greater extent within the next five years. The strongest increase was expected in materials management and value-added services, as well as in IT-related operations.

In international terms, the level of warehousing-related outsourcing would seem to be on a significantly lower level than in other high-income countries. For example, Langley *et al.* (2005) report some 20-30 per cent higher levels of outsourcing of the respective logistics operations. However, the majority of companies in that study had a turnover of US\$ 1 bn, whereas this study was limited to small- and medium-sized companies. In fact, the SME perspective on logistics outsourcing seems to have been almost totally ignored in logistics research thus far.

An attempt was made to identify the relationship between the outsourcing of logistics operations and the company context. It seems that companies, especially in manufacturing, that regard logistics as a more significant part of their business than their counterparts tend to have outsourced at least part of their logistics operations. The same conclusion can be made about efforts to monitor these operations. Thus, companies that place more emphasis on the monitoring of their logistics operations would also seem to be more likely to have outsourced at least some of them. It should be noted that the research design used in this article was not intended to reveal causality. Thus, we cannot claim that the context is the cause. It may well be the other way round: companies that engage in outsourcing do more monitoring and place more emphasis on logistics.

We also studied the linkage between logistics outsourcing, the level of logistics costs, and financial performance of the firms. We considered the relationship between logistics outsourcing and costs in a variety of ways. We analysed logistics costs as whole and as individual components, and conducted separate analyses among the manufacturing and trading industries. Although we found no statistically significant connection between outsourcing and logistics costs, the outsourcing of information processing and materials management-related services indicated a systematic tendency where the levels of total logistics costs as well as the levels of the individual logistics cost factors were lower among companies outsourcing heavily or not at all and higher for moderate outsourcers. This finding applies to both industries studied. According to these results, the relationship between outsourcing and the level of logistics costs is not as straightforward as often assumed.

It should be noted that the logistics cost levels of companies with and without outsourced logistics operations are not necessarily completely comparable. After all, the evaluations were based on self-reported estimates. Companies that have outsourced extensively are likely to be more aware of the actual costs because they are buying the service from outside. The findings concerning the relationship between logistics outsourcing and the company context, especially with regard to monitoring, would support this. In fact, companies that tend to outsource logistics operations also seem to put more effort into monitoring their logistics. Thus, the same companies may also be more aware of their costs and logistics performance than those that put less effort into performance monitoring. It is also possible that, although cost cutting is a common motive, other motives are dominant, and eventually prevail. The motives and their relationship to company performance are logical paths for further research.

We also examined a set of indicators of logistics performance, including the perfect order fulfilment and a number of indicators related to cash-to-cash cycle time and their relationship with logistics outsourcing. No statistically significant differences with regard to logistics outsourcing emerged, and in contrast to costs, the descriptive statistics did not reveal any observable tendencies on different levels of outsourcing.

An interesting – and a somewhat surprising – observation was that there seemed to be no loss in logistics performance due to outsourcing. In other words, logistics was being handled equally efficiently in the surveyed companies regardless of whether it had remained in-house or been outsourced. This finding suggests that the fit between the company context and its outsourcing decision might be more important a performance driver than outsourcing *per se*. This fit is one potential avenue for future research.

The final part of this article concerned the linkage between logistics outsourcing and financial performance. Intuitively, this link would seem to stretch furthest from the starting point, logistics outsourcing. Not surprisingly, given the findings on logistics costs and performance, no statistically significant relationships could be found.

In sum, although the potential gains from outsourcing are many, there seems to be no direct conclusive relationship between logistics outsourcing and logistics costs, and even less of a relationship with logistics performance. Outsourcing and its potential and real benefits are perhaps more of a company-level question: the objectives are many and the gains are diverse.

In general, logistics functions have been outsourced ever more and this trend is likely to continue. However, the global economic downturn in 2008-2010 has almost certainly slowed down the pace, as many manufacturing and trading companies have

had to cope with more urgent issues, and outsourcing plans may have been put to hold at least temporarily. With an improving economic outlook, these plans may be revived quickly. As noted by Langley and Caggemini (2010) the downturn has made it very clear that companies of all types need to take whatever steps are possible to reduce cost and enhance service. The authors also maintain that the concept of collaboration of people, process, and technologies can help significantly in achieving these objectives.

This article sends a message to companies planning to outsource their logistics operations: they should not expect any automatic advantages, and should thoroughly analyse the company-specific characteristics that might benefit from, or in some cases be harmed by the outsourcing decision. The more the companies are engaged in outsourcing, the more they monitor as well as collaborate internally and externally, or vice versa.

References

- Aertsen, F. (1993), "Contracting out the physical distribution function: a trade-off between asset specificity and performance measurement", *International Journal of Physical Distribution & Logistics Management*, Vol. 23 No. 1.
- Andersson, D. (1997), "Third party logistics – outsourcing logistics in partnerships", Linköping Studies in Management and Economics, Dissertations No. 34, Linköping Institute of Technology, Linköping.
- Arroyo, P., Gaytan, J. and de Boer, L. (2006), "A survey of third party logistics in Mexico and a comparison with reports on Europe and USA", *International Journal of Operations & Production Management*, Vol. 26 No. 6.
- Arvis, J.-F., Mustra, M.A., Ojala, L. and Naula, T. (2007), *Connecting to Compete: Logistics Performance Index and its Components*, The World Bank, Washington, DC, available at: www.worldbank.org/lpi
- Ashenbaum, B., Maltz, A. and Rabinovich, E. (2005), "Studies of trends in third-party logistics usage: what can we conclude?", *Transportation Journal*, Summer.
- Bardi, E.J. and Tracey, M. (1991), "Transportation outsourcing, a survey of US practices", *International Journal of Physical Distribution and Logistics Management*, Vol. 21 No. 3.
- Beaumont, N. and Sohal, A. (2004), "Outsourcing in Australia", *International Journal of Operations & Production Management*, Vol. 24 No. 7.
- Bettis, R.A., Bradley, S.P. and Hamel, G. (1992), "Outsourcing and industrial decline", *Academy of Management Executive*, Vol. 6 No. 1.
- Bhatnagar, R., Sohal, A.S. and Millen, R. (1999), "Third party logistics services: a Singapore perspective", *International Journal of Physical Distribution & Logistics Management*, Vol. 29 No. 9.
- Bolumole, Y.A. (2001), "The supply chain role of third party logistics providers", *The International Journal of Logistics Management*, Vol. 12 No. 2.
- Daugherty, P.J., Stank, T.P. and Rogers, D.S. (1996), "Third-party logistics service providers: purchasers' perceptions", *International Journal of Purchasing and Materials Management*, Vol. 32 No. 2.
- D'Aveni, R. and Ravenscraft, D.J. (1994), "Economies of integration versus bureaucracy costs: does vertical integration improve performance", *Academy of Management Journal*, Vol. 37 No. 5.
- Gilley, M.K. and Rasheed, A. (2000), "Making more by doing less: an analysis of outsourcing and its effects on firm performance", *Journal of Management*, Vol. 26 No. 4, pp. 763-90.

- Gooley, T.B. (1997), "The state of third-party logistics in Europe", *Logistics Management*, Vol. 36, January.
- Hilletoft, P. and Hilmola, O.-P. (2010), "Role of logistics outsourcing on supply chain strategy and management, survey findings from Northern Europe", *Strategic Outsourcing: An International Journal*, Vol. 3 No. 1, pp. 46-61.
- Juntunen, J., Grant, D.B. and Jari, J. (2010), "Short-run versus long-run trade-offs in outsourcing relationships: impacts on loyalty and switching propensity", *Strategic Outsourcing: An International Journal*, Vol. 3 No. 3.
- Kotabe, M. and Mol, M.J. (2009), "Outsourcing and financial performance: a negative curvilinear effect", *Journal of Purchasing and Supply Management*, Vol. 15.
- La Londe, B.J. and Maltz, A.B. (1992), "Some propositions about outsourcing the logistics function", *The International Journal of Logistics Management*, Vol. 3 No. 1.
- Langley, J. (1996), *Third-Party Logistics: Key Market/Key Customer Study*, The University of Tennessee/Exel Logistics, Knoxville, TN/Westerville, OH.
- Langley, J. and Caggemini (2010), *2010 Third Party Logistics, The State of Logistics Outsourcing, Results and Findings of the 15th Annual Study*, Georgia Institute of Technology, Atlanta, GA.
- Langley, J., Dort, E., Ang, A. and Sykes, S. (2005), *2005 Third Party Logistics, Results and Findings of the 10th Annual Study*, Georgia Institute of Technology, Atlanta, GA.
- Lieb, R.C. and Randall, H.L. (1996), "A comparison of the use of third-party logistics services by large American manufacturers, 1991, 1994 and 1995", *Journal of Business Logistics*, Vol. 17 No. 1.
- Ojala, L., Solakivi, T., Hälinen, H.-M., Lorentz, H. and Hoffmann, T.M. (2007), *State of Logistics in the Baltic Sea Region – Survey Results from Eight Countries*, Logon Baltic Reports No. 3:2007, available at: www.logonbaltic.info
- Sohail, M.S., Austin, N.K. and Rushdi, M. (2004), "The use of third-party logistics services: evidence from a sub-Sahara African nation", *International Journal of Logistics: Research and Applications*, Vol. 7 No. 1.
- Solakivi, T., Ojala, L., Töyli, J., Hälinen, H.-M., Lorentz, H., Rantasila, K. and Naula, T. (2009), *Finland State of Logistics 2009*, Ministry of Transport and Communications Finland Publications, Helsinki.
- Statistics Finland (2009), *Business Register, Enterprises 2008*, available at: www.stat.fi/tup/suoluk/suoluk_yritykset_en.html (accessed 14 December 2009).
- Stewart, G. (1995), "Supply chain performance benchmarking study reveals keys to supply chain excellence", *Logistics Information Management*, Vol. 8 No. 2, pp. 38-44.
- Töyli, J., Häkkinen, L., Ojala, L. and Naula, T. (2008), "Logistics and financial performance: an analysis of 424 Finnish small and medium-sized enterprises", *International Journal of Physical Distribution and Logistics Management*, Vol. 38 No. 1.
- Van Laarhoven, P., Berglund, M. and Peters, M. (2000), "Third party logistics in Europe – five years after", *International Journal of Physical Distribution and Logistics Management*, Vol. 30 No. 5.
- Wilding, R. and Juriado, R. (2004), "Customer perceptions on logistics outsourcing in the European consumer goods industry", *International Journal of Physical Distribution & Logistics Management*, Vol. 34 No. 8.

Further reading

- Arvis, J.-F., Mustra, M.A., Ojala, L., Shepherd, B. and Saslavsky, D. (2010), *Connecting to Compete 2010: Trade Logistics in the Global Economy – The Logistics Performance Index and its Components*, The World Bank, Washington, DC, available at: www.worldbank.org/lpi
- ELA/A.T. Kearney (2009), *6th A.T. Kearney/European Logistics Association Logistics Study 2008/2009*, ELA/A.T. Kearney, Chicago, IL.
- 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.
- Grossman, G.M. and Helpman, E. (2005), "Outsourcing in a global economy", *Review of Economic Studies*, Vol. 72.
- Hong, J., Chin, A.T.H. and Liu, B. (2004), "Firm-specific characteristics and logistics outsourcing by Chinese manufacturers", *Asia Pacific Journal of Marketing and Logistics*, Vol. 16 No. 3.

About the authors

Tomi Solakivi, MSc (Econ. & Bus. Adm), is working as an early stage Researcher at the Turku School of Economics at the University of Turku. Previously, Tomi Solakivi has worked as a Researcher at the Center for Maritime Studies, University of Turku. His research areas include logistics and financial performance and transport mode choice of freight transport.

Juuso Töyli, DSc (Econ. & Bus. Adm), DSc (Tech.), is acting Professor at Turku School of Economics, Finland. Previously, Juuso Töyli has served as acting Professor at Helsinki School of Economics and post-doctoral Researcher at Turku School of Economics as well as Senior Researcher at Helsinki University of Technology. He has also developed the SIMBU business management simulation game. His research interests include logistics and financial performance, management of services and technology, networking business, and business simulation games. Juuso Töyli is the corresponding author and can be contacted at: juuso.toyli@gmail.com

Janne Engblom, DSc (Econ. & Bus. Adm), MSc (Statistics), is Senior Lecturer at Turku School of Economics, Finland. He has done statistical consulting and analysis for research papers of economics and business administration, psychology, and medicine and biochemistry.

Lauri Ojala is Chair of Logistics at Turku School of Economics, Finland. His research interests include international logistics operations and markets. He has been expert for, The World Bank, ADB, and EC, amongst others; and initiated The World Bank's Logistics Performance Index (www.worldbank.org/lpi).

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints

	1	2	3	4	5
The time between order receipt and customer delivery	0.776	0.126	0.051	0.002	0.111
The ability to meet the quoted or anticipated delivery dates	0.808	0.155	-0.027	-0.032	0.140
The ability to respond to the needs and wants of key customers	0.730	0.142	0.029	0.085	-0.074
The ability to notify customers in advance of delivery delays and product shortages	0.711	0.066	0.049	0.110	0.164
The ability to modify order size, volume or composition during logistics operations	0.715	0.050	0.059	0.262	0.061
The ability to accommodate delivery times to specific customers	0.775	-0.002	0.180	0.142	-0.026
We regularly monitor and evaluate our logistics costs and performance internally	0.121	0.807	0.152	0.192	0.102
We regularly monitor and evaluate logistics costs and performance with selected suppliers and/or customers	0.096	0.787	0.151	0.040	0.196
We regularly benchmark logistics performance metrics against our competitors	0.219	0.574	0.170	0.210	0.265
Regular monitoring and evaluation of logistics benefits our firm	0.032	0.699	0.280	0.228	0.099
We regularly monitor the environmental effects of our logistics operations	0.118	0.681	0.029	0.190	0.097
Logistics has a major impact on our profitability	0.033	0.117	0.848	0.048	0.065
Logistics has a major impact on our customer-service level	0.044	0.156	0.889	0.032	0.026
Logistics is a key source of competitive advantage for our firm	0.136	0.113	0.850	0.145	0.047
Logistics is a top-management priority in our firm	0.095	0.344	0.655	0.293	0.076
We effectively share operational information within our firm	0.079	0.240	0.184	0.800	-0.023
We are well prepared for internal disturbances and irregularities in our operations	0.191	0.152	0.125	0.774	0.148
Strategic planning and target setting happen in collaboration between functions/departments	0.052	0.208	0.087	0.740	0.287
We are well prepared for external disturbances and irregularities in our operations	0.231	0.188	0.043	0.631	0.374
We effectively share operational information with selected suppliers and/or customers	0.170	0.318	0.184	0.399	0.589
Our information systems support the sharing of operational information with selected suppliers and/or customers	0.081	0.177	0.064	0.074	0.829
We effectively collaborate with selected suppliers and/or customers to facilitate operational planning and to improve forecasting	0.084	0.235	0.005	0.379	0.710

Notes: Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization; Kaiser-Meyer-Olkin measure of sampling adequacy 0.856; Bartlett's test of sphericity; Approx. $\chi^2 = 1,883.384$, df = 231, Sig. = 0.000

Table AI.
Rotated component
matrix of the company
context

SO
4,2

Appendix 2

150

	Component 1	Component 2
Domestic transportation	0.060	0.795
International transportation	0.159	0.896
Reverse logistics	0.207	0.783
Freight forwarding	0.228	0.805
Order processing	0.852	0.096
Invoicing	0.807	0.081
Warehousing	0.814	0.174
Inventory management	0.867	0.139
Product customization	0.747	0.204
Logistics IT	0.593	0.317

Table AII.

Rotated component matrix of outsourced activities

Notes: Principal component extraction and varimax rotation; Kaiser-Meyer-Olkin measure of sampling adequacy 0.872; significance <0.001

Appendix 3

	Cost factor 1	Cost factor 2
Transportation costs	0.545	0.076
Warehousing costs	0.716	0.147
Inventory-carrying costs	0.679	-0.044
Logistics-administration costs	0.493	0.429
Transport-packing costs	0.091	0.808
Other logistics costs	0.038	0.787

Table AIII.

Rotated component matrix of logistics costs

Notes: Principal component extraction and varimax rotation with eigenvalue over unit as the criterion to determine the number of factors; Kaiser-Meyer-Olkin measure of sampling adequacy 0.655; significance <0.001

Appendix 4

		N	Mean	Median	SD	Skewness	Kurtosis
ROA%	Manufacturing	111	12.46	10.71	16.09	0.23	0.99
	Trading	90	12.89	11.10	15.94	0.12	3.42
ROCE%	Manufacturing	111	23.47	21.55	33.76	-1.05	5.74
	Trading	90	31.75	24.66	131.47	0.34	21.82
EBIT%	Manufacturing	111	7.20	5.79	7.72	0.78	1.45
	Trading	90	5.30	3.92	6.32	1.10	5.02

Table AIV.

Descriptive statistics for the measures of financial performance

	ROA	ROCE	EBIT%
<i>Total sample</i>			
ROA	1		
<i>n</i>	222		
ROCE	0.514*	1	
<i>n</i>	201	202	
EBIT%	0.815*	0.378*	1
<i>n</i>	222	202	223
<i>Manufacturing companies</i>			
ROA	1		
<i>n</i>	117		
ROCE	0.816*	1	
<i>n</i>	111	111	
EBIT%	0.835*	0.627*	1
<i>n</i>	117	111	117
<i>Trading companies</i>			
ROA	1		
<i>n</i>	105		
ROCE	0.542*	1	
<i>n</i>	90	91	
EBIT%	0.826*	0.433*	1
<i>n</i>	105	91	106

Notes: Significant at the *0.01 level (two-tailed); EBIT%, earnings before interest and taxes as percentage of turnover; ROA, return on assets; ROCE, return on capital employed

Table AV.
Pearson correlation coefficients for the measures of financial performance

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.