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Nordic research in logistics and supply chain management: an empirical analysis

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Abstract

Purpose – The purpose of this data-based analysis is to report and reflect on the characteristics of the academic discipline concerned with logistics and supply chain management (SCM) as it is conducted in the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden). The paper further seeks to explain variations in the research field in terms of the demographics, research domains and methodologies, and publication patterns of the study's respondents.

Design/methodology/approach – An e-mail questionnaire survey was distributed to 353 researchers based in the Nordic countries. With 144 answers returned, the response rate was 41 per cent.

Findings – The study did not provide a clear picture of a distinct Nordic research paradigm applying to the study of logistics and SCM. The analysis shows as characteristic of research issues pursued by Nordic researchers the focus on supply chains and networks and the use of dyads, chains or networks of organizations as levels of analysis. The use of case study methodology and a highly diversified publication pattern were likewise evident. Most researchers were found to rely heavily on external research funding. Significant differences were also identified for research conducted by researchers holding PhD degrees as compared to research by respondents with lower degrees, for researchers affiliated with institutions based in the technical sciences in comparison to those in the social sciences, and for institutions according to their varying degrees of experience with research in the field and external funding.

Research limitations/implications – The research reported here may help individual researchers raise their consciousness about their own research.

Originality/value – This is the first empirical study to analyze research paradigms within logistics and SCM in the Nordic countries. It identifies a number of significant differences in regard to research patterns among various categories of researchers and institutions.

Keywords Supply chain management, Denmark, Finland, Iceland, Norway, Sweden

Paper type Research paper



Introduction

The discipline concerned with the research of logistics and supply chain management (SCM) is characterized by its close connection to the practical field (Stock, 1990, 1997; Kent and Flint, 1997) and its scholars exhibit a wide range of backgrounds (Murphy

and Poist, 1998). The differences may result in great variety in the ways research in logistics and SCM is conducted. Research in logistics and SCM is being conducted by a wide range of researchers, as evidenced, e.g. by their affiliations and degree of experience with research in logistics and SCM, whether or not they hold a PhD, and in how research projects are funded. This paper reflects on research within logistics and SCM as conducted in the Nordic countries (i.e. Denmark, Finland, Iceland, Norway and Sweden). In the literature as well as in practice there seems to be no consensus as to whether or not logistics and SCM are two distinct fields (Larson and Halldórsson, 2004; Larson *et al.*, 2007). In this paper, no explicit distinction between the two concepts is made. Therefore, the terminology applied here is logistics and SCM. In general, the academic discipline concerned with logistics and SCM is focused on a variety of empirical phenomena, applies a range of different methodological approaches and is based on a wide range of theories (Arlbjørn, 1999; Svensson, 2003; Halldórsson *et al.*, 2007; Vafidis, 2007). Research within logistics and SCM may be founded in a number of different research paradigms and may apply different methodologies. In comparison to research carried out in North America, European research has been found to rely more on interviews and case studies (Larson and Halldórsson, 2004), and the same holds true for Nordic research (Gammelgaard, 2001, 2004; Gubi *et al.*, 2003). A recent review of 442 survey-based articles published in the period 1999-2003 by *International Journal of Physical Distribution & Logistics Management*, *Journal of Business Logistics*, and *Supply Chain Management: An International Journal*, concluded that questionnaire surveys was the most dominant methodology (Sachan and Datta, 2005). Likewise, Frankel *et al.* (2005) completed an analysis of the methodologies applied in research published in journals. However, their analysis did not provide information concerning the field in general since it was restricted to articles published in *Journal of Business Logistics*, covering the period 1999-2004. But Frankel *et al.*'s study pointed to the same conclusion in finding the questionnaire survey to dominate. The purpose of the present paper is to describe the characteristics of the Nordic academic discipline concerned with logistics and SCM, as it was evidenced by the data. To achieve this purpose, the paper seeks to answer the following three research questions (RQs):

RQ1. Can a distinct Nordic paradigm for research in logistics and SCM be said to exist? And if so, what are its main characteristics?

RQ2. What research domains are found and what methodologies are being applied by Nordic researchers?

RQ3. What types of research are being published?

Knowing that the field is populated by a diverse group of researchers, we did not expect Nordic research to present a homogeneous picture. We were aware that several institutions have set up research groups quite recently, and also that some institutions do not offer PhD programs, or have only initiated PhD programs within the last few years. The increased competition for and reliance on external research funds was also evidenced. In order to compare research conducted by different types of researchers, the analysis considers the impact on research of the following four characteristics:

- (1) respondents' educational background as either PhDs or non-PhDs;
- (2) respondents' type of affiliation and their research groups;

- (3) institutions' varying degrees of experience with logistics and SCM research; and
- (4) the degree of the individual researcher's external funding.

The paper is organized into four sections. In the first section the conceptual framework of the analysis is described, followed by a section on methodology. The third section presents and discusses the results of the questionnaire survey while the last section discusses and concludes on some implications of the research.

Conceptual framework

In order to investigate and characterize Nordic research in logistics and SCM from a paradigmatic point of view, a clarification of what is meant by a paradigm is needed. The term paradigm was originally developed by Kuhn (1962), and has since been subjected to a variety of definitions. Thus, Masterman (1970) was able to outline as many as 21 interpretations of the term. In today's philosophy of science it is generally agreed that the concept of paradigm involves:

- (1) a knowledge content (a theory and its concepts);
- (2) an epistemology (a set of criteria for evaluating knowledge claims); and
- (3) a methodology (a procedure by which knowledge is to be generated).

According to Kuhn (1962) the three components constitute a unified, interdependent whole. Researchers apply theory, methods and procedures in order to develop new knowledge. Within a discipline, competing paradigms are found to exist alongside each other. An analysis of the paradigmatic conditions governing a research field requires the establishment of variables and dimensions for the characterization of its different research environments. Thus, the discipline consists of different research environments where research is being conducted according to either similar or different paradigms.

In the present context, the conceptual framework for researching the Nordic research tradition within logistics and SCM was decomposed into three groups of characteristics:

- (1) demographics;
- (2) research domains and methodologies; and
- (3) research publications.

Assuming that they would carry explanatory powers in outlining a hypothesized Nordic research tradition, we conducted a number of cross-comparative analyses. They involved on the one hand the first four demographic characteristics and, on the other, responses to questions concerning respondents' research domains and the methodologies applied, and on their publication patterns. Table I gives details for the demographic characteristics. Each of the three characteristic was linked to a question in the survey (Appendix).

Conceptual framework: demographic characteristics

As shown in Table I, demographic characteristics are elements describing the conditions governing research and the environments in which it was carried out.

The second characteristic of the overall conceptual framework concerned research domains and methodologies describing researchers' scientific approach. Table II

Characteristic	Explanation	References	Question in Appendix
<i>Demographic</i> Researchers with PhD degrees	Investigates whether the fact that a given respondent holds a PhD degree or not has any influence on the specific questions related to the respondent's research activities	–	1.1
Type of affiliation	Concerns researcher's affiliation; with a technical vs a social science research environment or a research institute	Gammelgaard (2001), Huang <i>et al.</i> (2002) and Gubi <i>et al.</i> (2003)	1.2
Degree of externally funded research	Focuses on the split of research funding between internal, government-based funds and externally based funds (i.e. by companies and organizations)	van Hoek (2001) and Gibson and Hanna (2003)	1.3
Logistics and SCM experience	Distinguishes the performance of the more experienced research institutions from the lesser-experienced research environments	Lancioni <i>et al.</i> (2001)	1.4
Academic position	The respondent's academic position	–	1.5
Own PhD program	Whether or not the research environment has its own PhD program	–	1.6
Number of researchers with PhD degrees	How many researchers at respondent's institution who have a PhD degree	–	1.7
Number of researchers in logistics and SCM	How many researchers there are at the affiliation	–	1.8
Time available for research	How much time is available for research, beyond teaching, supervision and administration?	–	1.9

Table I.
Conceptual framework:
demographic
characteristics

provides a further division of and more detailed information on the characteristics (see related questions in Appendix).

Conceptual framework: research domain and methodology characteristics

The third group of characteristics of the overall conceptual framework involved research publications. This factor was included with a view to investigating patterns in how respondents selected and prioritized among publication outlets such as journals or industry magazines. In the Nordic countries, and in Europe in general, there is currently a trend towards seeking publication in ranked, peer-reviewed journals.

Characteristic	Explanation	References	Question in Appendix
<i>Research domain and methodology</i>			
Research area	Relates to main processes, functions, systems, disciplines, etc. that the research focuses on. Common research areas include distribution structures, customer service, demand management, business relations	Stock (1990, 1997)	2.1
Entity of analysis	Indicates actors along the supply chains on which research is primarily focused	Gubi <i>et al.</i> (2003) and Halldórsson and Arlbjørn (2005)	2.2
Level of analysis	Indicates the scope of the research perspective (i.e. functional, firm, dyadic, chain and network levels)	Harland (1996), Gubi <i>et al.</i> (2003) and Halldórsson and Arlbjørn (2005)	2.3
Direction of research	Indicates whether research is directed mainly toward theory or practice		2.4
Characteristics of RQs	Addresses researchers' main purpose in performing research (e.g. descriptive or normative)	Dunn <i>et al.</i> (1994), Ellram (1996), Gubi <i>et al.</i> (2003) and Halldórsson and Arlbjørn (2005)	2.5
Research methodology	Describes researchers' most frequently applied research methodology	Dunn <i>et al.</i> (1994), Mentzer and Kahn (1995), Ellram (1996), Mentzer and Flint (1997), Garver and Mentzer (1999), Näslund (2002), Gammelgaard (2004), Frankel <i>et al.</i> (2005) and Sachan and Datta (2005)	2.6
Research contribution	Indicates researchers' perception of the balance of their research contributions to either theory testing, theory development, or a combination	Arlbjørn and Halldórsson (2002)	2.7
Most important journals	Indicates researchers' perception of the most important journals for their research	Kumar and Kwon (2004) and Svensson (2006)	2.8

Table II.
Conceptual framework:
research domain and
methodology
characteristics

This is increasingly being used as a metric for the allocation of public funding (Arlbjørn *et al.*, 2008a). Within the logistics and SCM research field, several studies of the perceived ranking of academic journals have been published (Carter, 2002; Gibson *et al.*, 2004; Kumar and Kwon, 2004; Carter *et al.*, 2005; Zsidisin *et al.*, 2007); we conclude that no agreement seems to exist. The range of publication outlets spans journal publications, books and book chapters, and articles in industry magazines (for an elucidation of this, see Appendix 3.1-3.7).

Methodology

The first paragraph describes the survey instrument and statistics while the second details selection and data collection procedures and discusses non-response bias.

The survey instrument and statistics

We investigated questions related to the three groups of characteristics outlined in the conceptual framework, as listed in the Appendix. Nine measures were used to describe the demographics of the studied population, eight measures for the research domain and the methodologies applied, while seven measures were used in relation to publication venues. In the measurement of characteristics, both nominal, ordinal and interval scales were used. χ^2 tests were administered to compare characteristics on nominal scales; the Mann-Whitney rank test (Siegel and Castellan, 1988) was used to compare characteristics on ordinal scales, and ANOVA for comparing means between characteristics on interval scales.

Selection, data collection and non-response bias

The population involved researchers engaged in the study of logistics and SCM and were affiliated with institutions based in the Nordic countries. The NOFOMA[1] mailing list provided the starting point for the identification and selection of the surveyed population. The NOFOMA being the major Nordic research network in the field, we turned to their list, which yielded 358 persons. However, a closer scrutiny revealed that several of the listed members either worked in non-research institutions or as researchers at institutions outside the Nordic countries and they were therefore removed. Furthermore, it was obvious that a number of persons and institutions performing research in logistics and SCM, or in related areas, did not appear in the NOFOMA list. Consequently, we contacted researchers from such institutions for help in reviewing the list. This led to more names, but also resulted in further deletions. In some cases, we also consulted institutions' web-pages in the search for relevant researchers. In total, 353 logistics and SCM-oriented researchers were identified, with 57 names from Denmark, 89 from Finland, 1 from Iceland, 84 from Norway, and 122 from Sweden.

A web-based survey was e-mailed to the 353 researchers in the revised list. Of these, 144 were completed and returned, resulting in an overall response rate of 41 per cent. Country specific response rates were 39 per cent for Denmark, 35 per cent for Finland, 100 per cent for Iceland, 38 per cent for Norway, and 48 per cent for Sweden. However, the focus of the overall analysis being the Nordic region as a whole, country specific analyses were not carried out. Respondents' academic job title and type of affiliation appear in Tables III.

Respondents' type of affiliation by job title. The number of respondents holding PhD degrees was 65 (45 per cent). A breakdown according to type of institution yielded

Job title	Type of affiliation		
	Technical	Social science	Research institute
Professor	15	15	0
Doctor	14	18	0
PhD student	25	29	5
Research fellow and other	7	2	14
Total	61	65	19

Note: Figures in table are number of responses

Table III.
Respondents' type of
affiliation by job title

61 respondents reporting affiliation to technical institutions (42 per cent), 64 to social science institutions (44 per cent), and 19 to research institutes (14 per cent). As χ^2 tests did not reveal significant differences for any of the mentioned groups or for national groups, we concluded that there is no significant non-response bias.

Findings

This section analyses and discusses the empirical data in four paragraphs. In the first paragraph we describe how respondents were divided into two groups according to four parameters:

- (1) whether or not they held a PhD degree;
- (2) affiliation to the technical or social sciences;
- (3) high or low degree of external funding; and
- (4) little or much experience in the logistics and SCM research field.

Then follow three sub-sections, according to the three types of characteristics outlined in the conceptual framework.

PhD degree, affiliation, funding and logistics and SCM experience

In order to allow an identification of patterns in their research activities, respondents were placed into eight sub-groups. Pairs of groups were formed in relation to the four parameters (doctoral degree, institutional affiliation, funding, and logistics and SCM research experience). The data showed that 65 respondents held PhD degrees while 79 did not. About 61 respondents reported affiliation to technical, and 64 to social science institutions. Respondents whose external research funding, as a proportion of their total research funding, was below 20 per cent were coded as having “little external funding”. Respondents with proportions at 70 per cent or above were coded as receiving “much external funding”. About 49 respondents belonged to the former group, 51 to the latter. Institutions with a maximum of 15 years of research experience in the field of logistics and SCM were coded as “low experienced”, while institutions with more than 15 years of experience were coded under “long experience”. The low-experience group held 71 respondents, the high-experience 73.

Demographics – a description of researchers and their affiliations

Tables IV and V show the wide distribution of demographic characteristics among researchers in the field.

Demographics by PhD and affiliation groups. Considering the entire selection, PhD students accounted for approximately 40 per cent while 20 per cent were professors. Research institutions concerned with the technical sciences and the social sciences were almost evenly represented. Less than 50 per cent of the researchers reported affiliation to institutions with their own PhD programs. A little more than half of the researchers (51 per cent) indicated that their institutions had more than 15 years of experience in the field. Approximately, one third worked in comparatively small research groups, counting less than four senior researchers with PhD degrees. On average, 46 per cent of the total research funds were received from external funds. The average amount of time spent on research was reported to be 48 per cent of full time.

A significant difference between researchers with doctoral degrees and those with lower qualifications (Table IV) was found in that the former reported to work in

Demographics	PhD degree		Affiliation	
	PhD (<i>n</i> = 65)	Non-PhD (<i>n</i> = 79)	Technical (<i>n</i> = 61)	Social science (<i>n</i> = 64)
<i>Academic position</i> ^a				
Professor	26 (48 per cent)	0 (0 per cent)	15 (25 per cent)	15 (24 per cent)
Doctor	19 (35 per cent)	7 (9 per cent)	14 (23 per cent)	18 (28 per cent)
PhD student	0 (0 per cent)	58 (73 per cent)	25 (41 per cent)	29 (45 per cent)
Research fellow and other	9 (17 per cent)	14 (18 per cent)	7 (11 per cent)	2 (3 per cent)
PhD degree ^a	65 (100 per cent)	0 (0 per cent)	32 (52 per cent)	29 (45 per cent)
<i>Type of affiliation</i> ^a				
Technical	32 (49 per cent)	29 (37 per cent)	N/A	N/A
Social science	29 (45 per cent)	35 (44 per cent)	N/A	N/A
Research institute	4 (6 per cent)	15 (19 per cent)	N/A	N/A
Own PhD program ^a	32 (49 per cent)	27 (34 per cent)	30 (49 per cent)	25 (39 per cent)
<i>Logistics and SCM experience</i> ^b				
Size (PhD) ^b	80	66	66	61
Size (total) ^b	77	69	69	58
Size (total) ^b	75	71	71	56
<i>Proportion external funds</i> ^c				
Research time ^c	0.50 (0.32)	0.42 (0.33)	0.51 (0.34)	0.38 (0.33)
Research time ^c	0.36 (0.021)	0.61 (0.26)	0.42 (0.25)	0.50 (0.27)

Note: ^aFigures are number of responses (per cent) and statistics are χ^2 tests; ^bFigures are mean ranks and statistics are Mann-Whitney U mean rank tests; ^cFigures are mean values (standard deviations) and statistics are *t*-tests. Cells in italic show significant differences ($p < 0.05$). Pair-wise tests are conducted between PhD and non-PhD groups, and technical and social science groups, respectively

Table IV.
Demographics by degree level and affiliation groups

Demographics	External research funds		Experience	
	Little (<i>n</i> = 49)	Much (<i>n</i> = 51)	Low (<i>n</i> = 71)	High (<i>n</i> = 73)
<i>Academic position</i> ^a				
Professor	7 (14 per cent)	15 (29 per cent)	11 (15 per cent)	19 (26 per cent)
Doctor	10 (21 per cent)	11 (22 per cent)	13 (18 per cent)	19 (26 per cent)
PhD student	26 (53 per cent)	17 (33 per cent)	36 (51 per cent)	23 (32 per cent)
Research fellow and other	6 (12 per cent)	8 (16 per cent)	11 (16 per cent)	12 (16 per cent)
PhD degree ^a	17 (35 per cent)	27 (53 per cent)	29 (41 per cent)	36 (49 per cent)
<i>Type of institution</i> ^a				
Technical	18 (37 per cent)	27 (53 per cent)	26 (37 per cent)	35 (48 per cent)
Social science	27 (55 per cent)	16 (31 per cent)	35 (49 per cent)	29 (40 per cent)
Research institute	4 (8 per cent)	8 (16 per cent)	10 (14 per cent)	9 (12 per cent)
Own PhD program ^a	19 (39 per cent)	25 (49 per cent)	29 (41 per cent)	30 (41 per cent)
<i>Logistics and SCM experience</i> ^b				
Size (PhD) ^b	44	56	36	108
Size (PhD) ^b	48	53	56	88
Size (total) ^b	45	56	60	85
<i>Proportion external funds</i> ^c				
Research time ^c	0.09 (0.09)	0.83 (0.11)	0.39 (0.32)	0.52 (0.33)
Research time ^c	0.51 (0.25)	0.49 (0.29)	0.50 (0.26)	0.49 (0.28)

Notes: ^aFigures are number of responses (per cent) and statistics are χ^2 tests; ^bFigures are mean rank and statistics are Mann-Whitney U mean rank tests; ^cFigures are mean values (standard deviations) and statistics are *t*-tests. Cells in italic show significant differences ($p < 0.05$). Pair-wise tests were conducted between groups with low and high degrees of external funding, and between low- and high-experience groups, respectively

Table V.
Demographics by external funding and experience groups

institutions with significantly longer experience in the research field. Quite surprisingly, PhDs were also found to spend less time on research activities, when compared to non-PhDs. With respect to institutional affiliation, another significant difference was found in that the technical institutions had significantly more researchers, and consequently larger research groups. They also reported larger proportions of external research funding, as compared to social science affiliates.

Demographics by external funding and experience groups. In general, research in the Nordic countries is funded by the states. Over the last five or ten years, a development toward making state-funding contingent on performance criteria, such as the number of passed students, the number of articles published in peer-reviewed journals, and their ability to attract grants, e.g. from independent public or private funds. In analyzing the demographic data according to the extent of external funding (Table V), two significant differences were identified. First, respondents reporting high proportions of external funding were affiliated with technical universities more often than with business schools (53 vs 31 per cent).

Secondly, a significant difference was established in that the respondents with much external funding were found to work in larger institutions with a long track record in research compared to respondents relying more on internal funding. When comparing data for institutions with differing amounts of experience in the field, we identified significant differences with respect to the number of research colleagues and to their relative proportions of external research funding. In both cases, researchers in high-experience environments reported higher figures. As the competition for external funds is getting tougher, it is interesting to notice that large, experienced technical institutions also reported the highest proportions of external research funding. It seems reasonable to assume that they attract most funds, but also that they are the more vulnerable because of their reliance on uncertain funding.

Research areas

Respondents were asked to describe their research area by marking three areas from among a list of 25 research areas (Table IV). The five highest ranking research areas were:

- (1) supply chains/networks (marked by 78 out of 144);
- (2) transportation (37 out of 144);
- (3) logistics/supply chain organization (34 out of 144);
- (4) business relationships (31 out of 144); and
- (5) distribution structures (28 out of 144).

The 25 areas were clustered into six groups as shown in Table VI. As a few respondents marked only one or two areas, the total comes to 432 (three short of the expected 384 answers).

Research areas by PhD degree, affiliation, experience and external funding groups. Table VI also allows a comparison of research areas in relation to the four pairs of characteristics. Three observations are made here. Firstly, no significant difference was identified between respondents holding PhD and those with lower degrees, or between researchers with little external research funding as compared to those with higher proportions. Secondly, researchers with technical affiliations were found to

Research areas	PhD degree		Type of affiliation		External research funds		Experience	
	PhD	Non-PhD	Technical	Social science	Little	Much	Low	High
Supply chain organization (<i>n</i> = 154)	66 (39)	88 (41)	67 (39)	75 (44)	52 (39)	52 (38)	86 (45)	68 (35)
Logistics/supply chain organization, business relationships, business processes								
Supply chain planning and control (<i>n</i> = 84)	35 (21)	49 (23)	48 (28)	25 (15)	29 (22)	32 (24)	37 (20)	47 (24)
Manufacturing planning and control, supply chain planning, distribution/transportation planning, demand management, information technology (incl. ERP, APS)								
Supply chain physical flow (<i>n</i> = 56)	26 (16)	30 (14)	24 (14)	21 (12)	17 (13)	21 (15)	30 (16)	26 (13)
Customer service, warehousing/material handling, transportation, manufacturing, purchasing, third party logistics								
Supply chain structure and design (<i>n</i> = 36)	16 (9)	20 (9)	13 (7)	17 (10)	15 (11)	12 (9)	11 (6)	25 (13)
Supply chains/networks, distribution structures, supply structures, product architecture and SCM								
Supply chain performance management (<i>n</i> = 33)	16 (10)	17 (8)	10 (6)	20 (12)	12 (9)	12 (9)	18 (9)	15 (8)
Logistics/supply chain costs, resource utilization, performance measurement								
Environment (<i>n</i> = 21)	4 (5)	12 (5)	10 (6)	11 (7)	9 (6)	7 (5)	8 (4)	13 (7)
Ethics/social responsibility, sustainability, environment, green logistics		0.68		11.8**		1.1		10.5*

Notes: * $p < 0.10$; ** $p < 0.05$. χ^2 tests were conducted between PhD and non-PhD, technical and social science affiliation, little and much external funding, and between low and high-experience groups, respectively. Figures given in parentheses are percentages. The specific research areas are listed under each main group of research area

Table VI.
Research areas by PhD degree, type of affiliation, experience and funding groups

focus to a significantly greater extent on supply chain planning and control as compared to social science affiliates; while the latter were found to study supply chain performance and organization more often than were technical affiliates. Thirdly, researchers in less experienced institutions reported focusing to a significantly greater extent on supply chain organization and less on areas such as supply chain planning and control and supply chain structure and design, when compared to those in more experienced environments. We hypothesize that the reason for this may be that the majority of the experienced institutions were technically oriented.

Research domain and methodology

Tables VII and VIII show that 46 per cent of all researchers reported manufacturing companies as their entity of analysis and 22 per cent indicate their study to concern carriers and third party logistics companies. With regard to the level of analysis, dyads were the most common focus (45 per cent), while 25 per cent of respondents stated their focus to be on chains or networks. Consequently, as many as 70 per cent of the respondents focused on dyads, chains or networks of organizations. A fairly even

Research domain and methodology	PhD degree		Affiliation	
	PhD (n = 65)	Non-PhD (n = 79)	Technical (n = 61)	Social science (n = 64)
<i>Entity of analysis</i> ^a				
Manufacturing	34 (52)	33 (42)	38 (62)	23 (36)
Carriers/3PL	11 (17)	21 (27)	8 (13)	15 (23)
Warehousing/retailing	5 (8)	9 (11)	5 (8)	7 (11)
None	15 (23)	16 (20)	10 (16)	19 (30)
<i>Level of analysis</i> ^a				
Firm	22 (34)	21 (27)	21 (34)	19 (30)
Dyad	27 (42)	38 (48)	28 (46)	27 (42)
Chain/network	16 (24)	20 (25)	12 (20)	18 (28)
Theory focus ^b	0.48 (0.20)	0.42 (0.21)	0.42 (0.18)	0.52 (0.22)
<i>Characteristics of RQ</i> ^a				
Descriptive	8 (12)	27 (34)	16 (26)	14 (22)
Understanding	33 (51)	31 (39)	27 (44)	29 (45)
Explanatory	13 (20)	15 (19)	9 (15)	15 (23)
Normative	11 (17)	6 (8)	9 (15)	6 (9)
<i>Research methodology</i> ^a				
Conceptual	15 (23)	13 (16)	13 (21)	12 (19)
Survey	5 (8)	5 (6)	1 (2)	7 (11)
Case study	33 (51)	52 (66)	42 (69)	30 (47)
Mathematical	12 (18)	9 (11)	5 (8)	15 (23)
<i>Research contribution</i> ^a				
Theory testing	2 (3)	11 (14)	4 (7)	7 (11)
Theory development	30 (46)	22 (28)	28 (46)	22 (34)
Balanced	33 (51)	46 (58)	29 (48)	35 (55)

Notes: ^aFigures are number of responses (per cent) and statistics are χ^2 tests; ^bFigures are mean values (standard deviations) and statistics are *t*-tests. Figures given in parentheses are percentages. Cells in italic show significant differences ($p < 0.05$) from expected values if evenly distributed (χ^2) or between mean values (*t*-test). Pair-wise tests were conducted between PhD and non-PhD groups, and technical and social science groups, respectively

Table VII. Research domain and methodology by PhD and affiliation groups

Research domain and methodology	External research funds		Experience	
	Little (<i>n</i> = 49)	Much (<i>n</i> = 51)	Low (<i>n</i> = 71)	High (<i>n</i> = 73)
<i>Entity of analysis</i> ^a				
Manufacturing	21 (43)	22 (43)	33 (46)	34 (47)
Carriers/3PL	7 (14)	15 (29)	13 (18)	19 (26)
Warehousing/retailing	10 (12)	6 (12)	8 (11)	6 (8)
None	15 (31)	8 (16)	17 (24)	14 (18)
<i>Level of analysis</i> ^a				
Firm	15 (31)	13 (26)	21 (30)	22 (30)
Dyad	19 (38)	25 (39)	34 (48)	31 (42)
Chain/network	15 (31)	13 (31)	16 (22)	20 (28)
Theory focus ^b	<i>0.54 (0.22)</i>	<i>0.41 (0.18)</i>	<i>0.47 (0.23)</i>	<i>0.43 (0.17)</i>
<i>Characteristics of RQ</i> ^a				
Descriptive	10 (20)	12 (23)	21 (30)	14 (19)
Understanding	22 (45)	25 (49)	30 (42)	34 (47)
Explanatory	11 (22)	10 (20)	11 (16)	17 (23)
Normative	6 (12)	4 (8)	9 (12)	8 (11)
<i>Research methodology</i> ^a				
Conceptual	7 (14)	13 (26)	14 (20)	14 (19)
Survey	5 (10)	3 (6)	5 (7)	5 (7)
Case study	28 (57)	31 (61)	42 (59)	43 (59)
Mathematical	9 (18)	4 (31)	10 (14)	11 (15)
<i>Research contribution</i> ^a				
Theory testing	6 (12)	4 (8)	7 (10)	6 (8)
Theory development	17 (35)	19 (37)	22 (31)	30 (41)
Balanced	26 (53)	28 (55)	42 (59)	37 (51)

Notes: ^aFigures are number of responses (per cent) and statistics are χ^2 tests; ^bFigures are mean values (standard deviations) and statistics are *t*-tests. Figures given in parentheses are percentages. Cells in italic show significant differences ($p < 0.05$) from expected values if evenly distributed (χ^2) or between mean values (*t*-test). Pair-wise tests were conducted between little and much external fund groups, and between low and high-experience groups, respectively

Table VIII.
Research domain and methodology by external funding and experience groups

distribution of research mostly directed toward theory (45 per cent), or toward practice (55 per cent), was attested. Of the respondents, 45 per cent reported their RQs primarily to aim at developing an understanding of complex systems, the majority of them (57 per cent) using case-study methodologies. Only 7 per cent indicated surveys to be their most common study method, which contrasts with the already cited studies into research methodology, which indicated questionnaire surveys as the most dominant methodology (Sachan and Datta, 2005; Frankel *et al.*, 2005). Regarding research contributions, a majority of researchers reported that they aim toward a balance between theory testing and theory development.

A comparison of research domains and methodologies for sub-groups also revealed a number of significant differences (Tables VII and VIII). RQs differed significantly for respondents with or without PhD degrees. About 51 per cent of PhD respondents reported the understanding of complex systems as a primary goal for their research, 17 per cent applied normative approaches, compared to 39 per cent and 8 per cent, respectively, for non-doctoral respondents. About 34 per cent of non-PhDs used

descriptive RQs, compared to 12 per cent for PhDs. The same pattern was found for respondents when held against their academic positions (professor, PhD student, or research fellow). Professors and research fellows reported using normative approaches to a significantly larger extent than did PhD students (23 per cent, 17 per cent, 9 per cent and 5 per cent, respectively). Among PhD students, 39 per cent indicated the use of descriptive RQs, which is a significantly larger proportion than for all other groups; for example, only one professor (3 per cent) used a descriptive approach. We can thus conclude that the lesser research experience, the greater the tendency toward descriptive purposes – and conversely, the greater experience, the greater the tendency toward normative research. Another significant difference between PhD and non-PhDs was that the former focused to a larger extent on theory development rather than on theory testing. Also, technical affiliates stated their entity of analysis to be manufacturing companies, while carriers and third party logistics providers featured less prominently for this group when compared to researchers from the social sciences. The research methodologies employed were likewise found to vary with affiliation. In the social sciences, surveys and mathematical modeling were much more widespread than in the technical sciences, where researchers typically used case work in close interaction with companies. The degree of external funding showed significant differences only with regard to researchers' orientations toward practice or theory, with a concurrence of low-external funding and theory orientation, and high-external funding with practical orientation.

Research publications

Tables IX and X give the average number of publications per researcher for the years between 2000 and 2005. Disregarding institutional affiliation, the average respondent reported the publication of 2.8 journal papers, 5.2 conference papers, 1.4 book chapters and 2.3 articles in industry magazines. Compared to the USA, this might indicate of a low level of researcher productivity, but the current differences in the incentive systems across continents may play a role in this. However, the Nordic countries, and Europe in general, are witnessing a trend toward publishing in ranked journals as a result of shifting performance indicators in public funding (Arlbjørn *et al.*, 2008a).

Research publications	PhD degree		Affiliation	
	PhD (<i>n</i> = 65)	Non-PhD (<i>n</i> = 79)	Technical (<i>n</i> = 61)	Social science (<i>n</i> = 64)
Journals	4.8 (5.3)	0.8 (1.6)	3.3 (4.9)	2.5 (4.0)
Conference proceedings	7.0 (6.0)	3.2 (5.1)	6.0 (6.5)	4.6 (5.6)
Book chapters	2.1 (3.5)	0.6 (2.4)	1.0 (1.8)	1.8 (4.1)
Monographs	0.9 (1.1)	0.4 (b1.1)	0.7 (1.0)	0.6 (1.2)
Research reports	3.3 (4.9)	2.5 (4.1)	2.1 (3.6)	1.8 (2.9)
Work in progress series	1.7 (2.6)	1.0 (2.3)	1.4 (2.9)	1.0 (1.6)
Industry magazines	2.9 (4.8)	1.5 (4.5)	2.6 (5.3)	1.2 (2.6)

Table IX. Research publications by PhD and affiliation groups

Notes: Figures are mean values (standard deviations) and statistics are *t*-tests. Cells in italic show significant differences ($p < 0.05$) between mean values. Pair-wise tests were conducted between PhD and non-PhD groups, and technical and social science groups, respectively. Data from 2006

Research publications	External research funds		Experience	
	Little (<i>n</i> = 49)	Much (<i>n</i> = 51)	Low (<i>n</i> = 71)	High (<i>n</i> = 73)
Journals	2.4 (4.9)	2.4 (3.5)	2.2 (4.5)	2.8 (4.0)
Conference proceedings	3.9 (5.2)	5.9 (6.7)	4.5 (5.6)	5.2 (6.0)
Book chapters	0.8 (3.0)	1.9 (3.4)	<i>0.6 (1.3)</i>	<i>2.0 (4.0)</i>
Monographs	<i>0.4 (0.9)</i>	<i>0.8 (1.1)</i>	0.5 (0.9)	0.8 (1.2)
Research reports	1.9 (3.9)	3.2 (4.5)	2.8 (4.7)	3.0 (4.2)
Work in progress series	1.1 (2.1)	1.6 (3.1)	1.2 (2.1)	1.4 (2.8)
Industry magazines	<i>0.8 (2.4)</i>	<i>2.9 (5.4)</i>	<i>1.3 (2.6)</i>	<i>2.9 (5.9)</i>

Notes: Figures are mean values (standard deviations) and statistics are *t*-tests. Cells in italic show significant differences ($p < 0.05$) between mean values. Pair-wise tests were conducted between little and much external fund groups, and between low- and high-experience groups, respectively. Data from 2006

Table X. Research publications by external funding and experience groups

Likewise, a trend toward basing PhD dissertations on a collection of articles, rather than on a monograph is discernible in the Nordic countries. For instance, at the doctoral symposium held in connection with the 2007 NOFOMA conference more than half of the attending PhD students indicated that their dissertation would be organized as a collection of articles. But in spite of the increased focus on peer-reviewed journal publications, several alternative publication types are still being considered as important.

Research publications by PhD and affiliation groups. The following significant differences were identified for the four pairs of characteristics (Tables IX and X). Holders of PhD degrees were found to publish significantly more journal and conference papers and book chapters when compared to non-PhDs. The data show that social science affiliates published significantly more book chapters, but significantly fewer industry magazine articles when compared to their technical colleagues.

Research publications by external funding and experience groups. Researchers in institutions with high proportions of external funding reported the publication of significantly larger numbers of monographs and articles in industry magazines than did researchers from institutions with little external funding. Researchers in institutions with long research experience contributed significantly more to anthologies and industry magazines when compared to those in low-experience institutions. This indicates the importance for researchers in experienced and externally funded institutions of reaching wider audiences than those who read journal articles.

Respondents were also asked to list the three journals of the field which they perceived to be most important (defined as top tier journals from their perspective). A total of 94 academic journals were indicated as important for the field. Such evidence of a very diverse use of journals is supported by Vafdis's (2007) analysis. The 15 top ranked journals were (the number of nominations given in parenthesis):

- (1) *International Journal of Physical Distribution & Logistics Management (JPDLM)* (48).
- (2) *International Journal of Logistics Management (IJLM)* (32).
- (3) *Journal of Business Logistics (JBL)* (24).

- (4) *International Journal of Operations and Production Management (IJOPM)* (17).
- (5) *Transportation Research (TR)* (17).
- (6) *Supply Chain Management: An International Journal (SCM)* (16).
- (7) *Journal of Operations Management (JOM)* (12).
- (8) *International Journal of Production Economics (IJPE)* (9).
- (9) *Management Science (MS)* (9).
- (10) *International Journal of Logistics: Research and Applications (IJL)* (9).
- (11) *Journal of Purchasing and Supply Management (JPSM)* (7).
- (12) *Production Planning and Control (PPC)* (6).
- (13) *International Journal of Production Research (IJPR)* (6).
- (14) *European Journal of Operational Research (EJOR)* (5).
- (15) *Industrial Marketing Management (IMM)* (4).

Perceived most important journals. Among the above, the three highest ranked journals were:

- (1) *International Journal of Physical Distribution & Logistics Management;*
- (2) *International Journal of Logistics Management;* and
- (3) *Journal of Business Logistics.*

The overall ranking was almost identical for each of the four pairs of research characteristics (Table XI). Previous rankings, however, have shown different results (Carter, 2002; Gibson *et al.*, 2004; Kumar and Kwon, 2004; Carter *et al.*, 2005; Zsidisin *et al.*, 2007) although the ranking identified here cannot be said to have been contradicted. It is characteristic of all the top ranked journals in our list that they focus on empirical research, specialize in logistics and SCM, and carry a relatively high proportion of case-based studies. Several of the previously published lists showed higher rankings for journals with a larger proportion of operations research and less emphasis on empirical studies.

Conclusions and implications

The study reported here set out to investigate whether a distinct Nordic research paradigm for the study of logistics and SCM can be said to exist. In order answer the question, we developed a framework of characteristics describing the demographics, domains and methodologies, and publication patterns of the population. We found that Nordic research in the field is carried out by researchers with affiliations to technical institutions as well as to social science institutions. The typical research area was found to be supply chains and networks, with dyads, chains or networks of organizations as the preferred levels of analysis. Case-study methodologies were prevalent. Different types of publications, ranging from peer-reviewed journals to industry magazines, were concurrently used as venues. Most researchers rely heavily on external research funding. Important contributions to research come from researchers affiliated with the technical and social science as well as from those with relations to research institutes. Likewise, PhD students feature importantly in the overall picture shown by research publications. Comparing researchers according

PhD	PhD degree	TU	Affiliation	External research funds		Low	Experience
				BS	Little		
<i>IJPDLM</i> (20)	<i>IJPDLM</i> (28)	<i>IJPDLM</i> (24)	<i>IJPDLM</i> (20)	<i>IJPDLM</i> (14)	<i>IJPDLM</i> (20)	<i>IJPDLM</i> (21)	<i>IJPDLM</i> (27)
<i>IJLM</i> (15)	<i>IJLM</i> (17)	<i>IJLM</i> (13)	<i>IJLM</i> (16)	<i>IJLM</i> (8)	<i>IJLM</i> (18)	<i>IJLM</i> (13)	<i>IJLM</i> (19)
<i>JBL</i> (11)	<i>JBL</i> (13)	<i>IJOPM</i> (12)	<i>JBL</i> (11)	<i>IJOPM</i> (7)	<i>JBL</i> (13)	<i>JBL</i> (11)	<i>JBL</i> (13)
<i>JPSM</i> (11)	<i>IJOPM</i> (9)	<i>JBL</i> (11)	<i>SCM</i> (6)	<i>JBL</i> (5)	<i>IJOPM</i> (10)	<i>IJOPM</i> (6)	<i>IJOPM</i> (11)
			<i>MS</i> (6)	<i>JOM</i> (5)			<i>SCM</i> (11)
<i>IJOPM</i> (8)	<i>TR</i> (8)			<i>IJPE</i> (5)			
				<i>MS</i> (5)			
					<i>JOM</i> (6)	<i>TR</i> (5)	<i>JOM</i> (6)
					<i>SCM</i> (6)	<i>MS</i> (5)	
					<i>JPSM</i> (5)		

Note: Numbers given in parentheses refer to number of respondents

Table XI.
Perceived most important
journals

to their level of education, it is clear that those with PhD degrees were significantly more productive. Thus, our empirically based analysis shows that Nordic research in logistics and SCM exhibits a number of typical characteristics. In order to allow for closer comparison, respondents were divided into four groups:

- (1) respondents with a PhD degree vs respondents with lower degrees;
- (2) respondents affiliated with technical institutions vs respondents affiliated with the social sciences;
- (3) respondents affiliated with institutions receiving little vs institutions receiving much external research funding; and
- (4) respondents affiliated with institutions with little experience in the field of logistics and SCM vs respondents from high-experience institutions.

Based on our analysis of the findings, we have shown that researchers with PhD degrees are more concerned with theory development than theory testing. Technically affiliated researchers focus more on manufacturers while the primary focus for social science affiliates is on carriers and third party logistics providers. Research in social science institutions is typically based on surveys and modeling. In comparison to business schools, the technical universities rely more heavily on external funding, and research is more case-based and interacts more closely with industry.

On the basis of Kuhn's (1962) conception of a paradigm, a paradigmatic element seems to be identifiable with regard to the methodological level, where an emphasis on qualitative research (especially case studies) is evident in Nordic research. Regarding Kuhn's view of epistemology, i.e. the criteria for evaluating knowledge, we indirectly say that there is less consensus through the analyses of different practice with external funding and perception of the most important journals for their research. These factors do provide different criteria for evaluating knowledge. Lastly, Kuhn's knowledge content criteria in the paradigm illumination also provide a relatively diverse view of the discipline. Logistics and SCM spans a wide range of research areas. Nordic researchers were found to focus on different research areas within the names of logistics and SCM. The present analysis therefore cannot be said to provide clear evidence of the existence of something approaching a distinct Nordic research paradigm.

In addition to offering some characteristics of Nordic research in the field of logistics and SCM, our findings may serve to raise individual researchers' consciousness of their own research, whether they work in the Nordic area or not. Establishing a clear research profile should be relevant for all active research workers. Furthermore, our paper may contribute to a better understanding of the different research traditions to be met when collaborating on research with colleagues outside the region. In order to approach a conclusion on the identity of "typical" Nordic research, comparisons with international research would be required, e.g. by expanding the scope of this empirical study to include a wider European perspective. This could be done by engaging the memberships of the European Logistics Association and the American based Council of Supply Chain Management Professionals.

This paper represents a first attempt at providing the necessary data for a study of Nordic research in logistics and SCM. Despite its inclusive nature, we concede clear limitations to our work. For example, the procedure for selecting respondents may

have omitted individual researchers and research groups who did not appear in the NOFOMA mailing list, and whom we failed to identify. Furthermore, the research field has no clear definition, and consequently no clearly defined population. This points to a weakness of any generalizations on the findings, but it seems reasonable to assume that the distribution of job titles and affiliations among our respondents would be representative of the total population.

On the basis of our research, five implications for the direction of future research can be outlined. Firstly, Nordic research in logistics and SCM is being carried out by small and relatively newly established research groups with widely differing institutional affiliations. The study indicates that experienced research groups receive higher proportions of external funding, and possibly also work in closer connection with industry than do newer and less experienced research groups. From the research policy perspective this gives cause for reflections on whether establishing larger research environments would be advantageous. However, no difference was found regarding the amount of time allotted to research between researchers with little and much external research funding. Consequently, the value of the time spent on applying for external funds is brought into question, just as the vulnerability of larger institutions relying on external research funds is emphasized. Secondly, the attested variation in types of research and the relatively large number of institutions focusing on logistics and SCM, as also the relatively high proportion of newly established environments, indicates that it is relatively easy to establish new research environments within this area and/or to change the direction of ongoing research toward a stronger emphasis on logistics and SCM. Thirdly, our evidence questions the wisdom of relying heavily on research education and training (PhD programs) unless highly productive research environments employing doctor qualified researchers, as these are significantly more productive than non-PhDs when measured by publication frequency. Fourthly, research in logistics and SCM is shown to be closely connected with industry when compared with other disciplines. As this may facilitate its funding from external, industrial sources, there is cause for debating the researched topics and the types of publication outlets. We indicated earlier that researchers with high proportions of external research funding were not found to spend more time on research than did those with little external funding. Consequently, it is questionable whether this state of affairs points in a desirable direction, especially when viewed in the light of calls for strengthening basic research within the discipline. As a fifth point for future research, we might point to the need to investigate whether the current global-wide trend toward publishing in ranked peer-reviewed academic journals actually fulfills the demands for industry relevant research. It may be asked whether these objectives support or contradict each other. A further question would involve the formulation of an explicit and public basis for the ranking of those highly feted stars among journals.

Note

1. NOFOMA is a network of Nordic researchers within the field. It aims to contribute to the continuous improvement and further development of research in Nordic logistics and SCM. It hosts annual conferences on logistics and SCM, alternating among Nordic countries and institutions. Its twentieth anniversary was celebrated in Finland, June 2008. PhD days and courses on the philosophy of science and methodology are also organized under the aegis of NOFOMA (Arlbjørn *et al.*, 2008b, p. 24). See www.nofoma.org for further information.

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Appendix. Survey instrument

Demographics

- 1.1 PhD degree – what is your educational background? Answer: (1) PhD, (2) non-PhD.
- 1.2 Type of affiliation – where are you working now? Answer: (1) technical university, (2) social science/business school, (3) research institute.
- 1.3 Research funds – please indicate (judge) the percentage-wise division of funding of your overall research between university internally/government and industry/external funds (split 100 per cent between the two options): percentage funded by university/government, percentage funded by industry/external funds.
- 1.4 Logistics and SCM experience – for how many years has your institution been doing research in logistics and supply chain management? Answer: <5 years, 5-15 years, 16-25 years, > 25 years.
- 1.5 Academic position – what is your academic position? Answers: (1) professor, (2) associate or assistant professor, (3) PhD student, (4) research fellow or other.
- 1.6 Own PhD programme – does your institution have its own PhD programme in logistics and supply chain management? Answer: yes/no.
- 1.7 Size (PhD) – what is the number of logistics researchers with PhD degrees at your institution? Answer: 1-3, 4-6, 7-10, > 10.
- 1.8 Size (total) – what is the total number of logistics researchers (including PhD students) at your institution? 1-3, 4-6, 7-10, 10-20, > 20.
- 1.10 Research time – please indicate the percentage-wise division of your time spent on the following activities (split 100 per cent between the four options): percentage of research, percentage of doctoral education (supervision etc), percentage of BSc/MSc/MBA education, percentage administration and service.

Research domain and methodology

- 2.1 Research area – what are your three primary research areas? Please only mark three of: supply chains/networks, distribution structures, supply structures, customer service, logistics/supply chain costs, resource utilisation, warehousing/material handling, transportation, manufacturing, purchasing, third party logistics, demand management, supply chain planning, distribution/transportation planning, manufacturing planning and control, logistics/supply chain organisation, ethics/social responsibility, business relationships, information technology (incl. ERP, APS), sustainability, environment, green logistics, product architecture and SCM, performance measurement, business processes.

- 2.2 Primary entity of analysis – my research is, in general, mainly concerned with: (1) manufacturers, (2) carriers, (3) wholesalers, (4) retailers, (5) third party logistics companies, (6) none of the above.
- 2.3 Level of analysis – the level of analysis in my research, in general terms, is mainly: (1) a functional level, (2) a firm level, (3) a dyadic level, (4) a chain level, (5) a network level.
- 2.4 Direction of research – which direction is your research most directed to (in an overall judgement)? (Split 100 per cent between the two options): (1) percentage toward theory, (2) percentage toward practice.
- 2.5 Characteristics of RQs – please make an overall judgement of the characteristics of your RQs, Answer: (1) my RQs are primarily to describe/explore, (2) my RQs are primarily to develop understanding (of complex systems), (3) my RQs are primarily to explain (cause-effect), (4) my RQs are primarily to be normative.
- 2.6 Research methodology: (1) conceptually based, (2) survey, (3) case study, (4) mathematical modelling.
- 2.7 Research contribution – in my research, I am most interested to: (1) test theory, (2) develop new theory, (3) balance both equally.
- 2.8 Which are the three most important journals in your field (being top tier journals from your perspective)? (list three journal names).

Research publications

- 3.1 Have you published articles in international research journals (peer-reviewed) since year 2000 to date? If yes, how many?
- 3.2 Have you published articles in international conference proceedings since year 2000 to date? If yes, how many?
- 3.3 Have you published chapters in books since year 2000 to date? If yes, how many?
- 3.4 Have you published monographs (books, dissertations, etc.) since year 2000 to date? If yes, how many?
- 3.5 Have you published other research reports since year 2000 to date? If yes, how many?
- 3.6 Have you published articles in work in progress series since year 2000 to date? If yes, how many?
- 3.7 Have you published articles in industry magazines since year 2000 to date? If yes, how many?

About the authors

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