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Interfirm Linkages and the Vertical Structure and Dynamics of  
the Danish Trucking and Congress Tourism Industries

By

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**Danish Research Unit for Industrial Dynamics**

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## Interfirm Linkages and the Vertical Structure and Dynamics of the Danish Trucking and Congress Tourism Industries

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### **Abstract:**

This paper questions the overall role of interfirm linkages in industrial dynamics. Studying Danish trucking and congress tourism, the paper addresses a number of particular questions concerning how industry responds to changing conditions. In trucking, the important interfirm linkages are pecuniary and entails nontrivial exchange among multiple dispersed agents, while in congress tourism Inter-organizational linkages are more strategic, with the activities of multiple agents forming together into products, without direct exchange.

**Key words:** Industrial dynamics and evolution; inter-organizational linkages; vertical industry structure and division of labor; trucking; tourism

**Jel codes:** L14; L22; O14

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## 1. Introduction

What determines the vertical scope and division of labor among firms in an industry? This broad but fundamental question has attracted considerable interest from neo-institutional economists, most notably within the confines of transaction cost economics (TCE) and the capability or evolutionary theory of the firm. In TCE, the problem is simply one of choosing the appropriate governance structure from a set of discrete alternatives. In the capability or evolutionary theory of the firm this choice is determined to a large extent by capabilities and routines and thus rests on a firm's path-dependent knowledge of how to do things. Research in both these directions has focused on the question mainly from analysis of the individual transaction or firm, few have attempted to examine it at the industry level. We cannot fully appreciate the nature and determinants of the broader institutional structure of production, which in our interpretation includes interconnectedness and interdependencies among firms (and among firms and other organizations), simply from analysis at the level of the firm or even the single transaction (Coase 1992). By shifting the level of analysis to the industry, we claim that the choice of organizational form would be seen as more obviously determined by the unique conditions of the industry at any particular point in time.

This paper is an attempt to understand the generative role played by the existing institutional structure in the vertical structure and dynamics of actual industries. It addresses a number of important questions in this regard: What role do boundary conditions such as information and communication technology (ICT) and sources of variety in demand play in the structure and dynamics of industries? How do different (types of) interconnections and interdependencies among firms influence the structure and dynamics of industries? Which factors work to enforce or break up the structure of industries? The answers to these questions may advance our understanding of what determines the vertical scope and division of labor among firms in an industry. We found it possible to gain some partial advance by exploring the details of two vertically divided and specialized industries.<sup>1</sup> In this paper we thus report on our studies of organizational evolution in Danish trucking and congress tourism, including meetings, incentives, conferences and exhibitions (MICE).

Especially, the paper explores the role of different kinds of interfirm linkages in the structure and dynamics of such industries. It demonstrates how the institutional structure of an industry comprises a socially and historically determined arrangement that is ambidextrous and capable of self-replication. Underlying this conception is the idea that the vertical structure of an industry at any point in time is the evolutionary response to the issue of providing value to

customers. With our argument rooted in the analysis of the two industries, we argue that inter-organizational modes of coordination allow firms to concurrently discard complexity and acquire relevant information and thus sustain the basis for vertical specialization and disintegration over time, even when other determinants of industry structure are unstable in the short run. In trucking, such linkages are pecuniary and entails nontrivial exchange relationships among multiple, dispersed economic agents. In congress tourism, they are also of a more strategic kind, where the discrete activities of multiple agents form together into an overall offering, without direct exchange among the agents.

The remainder of the paper falls in four sections. Section 2 considers the data and methodology of the study. In section three we analyze the structure and dynamics of the two industries. Section four discusses the relevance of the findings for the study of the structure and dynamics of industries and further elaborates on the nature and role of interfirm linkages. Section five summarizes the analysis and points towards prospective areas of future research.

## **2. Data and Methodology**

The focus of this paper on the role of interfirm linkages in shaping industrial structure and dynamics touches on unfamiliar grounds and therefore adopts a descriptive and exploratory, rather than prescriptive approach. It is a first step towards establishing a framework for future prescriptive strategies. The validity of the paper relies on the readers' inspection of our assumptions and choices and as such relates to construct validity (Yin 2003). We believe that by looking at interconnections in actual industries provides for a richer description and deeper understanding of industry dynamics. In short, this paper represents a novel approach to the study of the role of interfirm linkages in the structure and dynamics of industries, explaining firm behavior by means of both economic and social factors.

To explore and develop the idea that connections and interdependencies are important for the structure and dynamics of industry, the paper provides detailed case studies of Danish trucking and congress tourism over the 1990s. Both of these are service-producing industries exhibiting interesting patterns of interfirm interdependencies. In both industries demand fluctuates and flexibility and capacity utilization are important strategic dimensions. Our analyses, which are multilevel, outline some basic characteristics of the industries. Here, we reflect on their composition, internal linkages and linkages with the more general environment. This provides a context for more detailed considerations of the two industries. The background analyses proceed by

inquiring with a behavioral orientation into what firms in the industries actually do and why. Our study is qualitative in nature as the aim is to understand how and why firms act as they do.

**Table 1: Interview sample**

Respondents	Number of interviews	
	Trucking	Congress tourism
<b>Core companies</b>	12 (2 express couriers, 7 trucking, 1 furniture and 2 logistics)	9 (5 hotels, 4 congress organizers)
<b>Periphery companies</b>	7 (2 software, 5 retail)	4 (2 trucking, 2 tourism organizations)
<b>Trade associations</b>	2 (1 carriers, 1 transport buyers)	3
<b>Public officials</b>	1	3
<b>Consultants</b>	1	1
<b>Area Associations</b>		1 (WoCo)

We rely primarily on qualitative data obtained through interviews with firms and industry experts in the two industries. Firms in the interview sample include what we refer to as core firms (i.e., firms in the industry) and periphery firms (i.e., firms servicing the core firms as suppliers, but which belong to essentially different industries). A total of 44 interviews were carried out with public officials, managers of trade associations, consultants and other industry experts as well as owners, chief executives and middle managers from core and peripheral firms. Table 1 gives an overview of the sample. To describe the structure, performance and evolution of the industries, we use secondary sources and descriptive statistics to some extent.

By explicitly portraying the industries as dynamical systems we seek to overcome a number of the simplifications that are at the root of more axiomatic understandings of the structure and workings of industries. This includes bringing in other agents than firms and perceiving the internal structure and behavior of those agents in greater detail.

### 3. Industry Case Studies

To explore the role of interfirm linkages in long run industry morphology, we need to address both unique industry conditions and the way history matters for their replication and development, as well as the nature of demand and the various forms it takes, where change includes both short-term fluctuations and long-run structural change.

## **Trucking**

The Danish trucking industry is part of a wider system that includes freight forwarders, carriers (all modes), shippers and other customers, logistics firms, regulators and more. It is quite fragmented and consists mostly of small and medium-sized firms (SMEs) and very few large firms. It is also highly diversified in terms of markets served, with many carriers moving general freight and others catering to specialized markets. The nature of trucking may require decentralization to be carried further than in many other industries. In the case of the simple movement of goods from A to B diversity can usefully be interpreted as a consequence of micro-level diversity in the demands of shippers such as, e.g., demand for different destinations. There may also be local differences in culture, taste, consumer preferences, and environmental regulation influencing the needs of shippers for transport and logistics. Finally, time and speed are increasingly important to shippers in a growing number of industries.

Retail may require shipments on a tight and regular schedule in specialized vehicles within a scattered geographical area. This favors very particular types of specialized carriers. Manufacturing of high value/low volume goods may require equally specialized services. The delivery of office systems may require consolidated deliveries, favoring LTL trucking. Manufacturing of consumer durables implements far reaching just-in-time (JIT) systems with direct impact on its points of contact with carriers. As a CEO in a large Danish trucking company notes 'it is widely known that within this business you do not hang yourself in the string of a bell' when it comes to working overtime or late hours. Clerical workers stay until the work is done.<sup>2</sup> Other types of manufacturing may restrict planning opportunities to an even greater extent and favor less specialized, more flexible carriers. With domestic distribution between warehouses and retail outlets, for example, most manufacturers of consumer durables prefer to contract on a short-term basis with flexible local or regional carriers or couriers.

On this basis, one may distinguish between different segments within the trucking industry, including firms that use general-purpose equipment to handle general commodities and those that use specialized equipment to handle special commodities, firms that haul over long distances and those that specialize in operations in and around a particular local area. General carriers use standard equipment and compete in the large general and highly contestable markets for freight transport where entry and exit barriers are low. Potential entrants in this segment are likely to be in international transport since the national deregulations and the European integration are expected to

increase the size of this particular market.<sup>3</sup> Special carriers increasingly engage in logistics activities, and not only the physical movement of goods.

A distinction can also be made based on the size of the loads hauled. The representative full truckload (TL) carrier sends a driver with a tractor-trailer to a shipper's dock to fill up the trailer with one large load. The driver then takes the loaded trailer to its destination and unloads at the dock of the receiver, only to continue to the next location to pick up a new full load. TL carriers do not typically require terminals for cost-competitive operations. In comparison, the TL carrier is the less-than-truckload (LTL) carrier aggregates smaller shipments collected at local terminals by local drivers into full trailer loads for transshipment on fixed routes.

The structure of the trucking industry experiences rapid and continuous change. Traditionally, the industry consisted mainly of TL and LTL carriers. While especially the LTL segment has experienced dramatic structural changes on its own, recent years have also seen entry of new kinds of firms such as package express carriers and information and logistics firms into the industry. Adding to the complexity outlined here, firms in the industry also cover many different activities such as forwarding (preparation of documentation), haulage, payment, coordination of combined transports, value adding logistics services, and much more and, accordingly, the industry includes many different types of firms.

Thus, it is practically impossible to define the trucking industry narrowly in terms of a single, dominant product. Each operation is in essence unique, determined as it is by place of origin and destination, route taken, size and type of goods carried as well as the extent to which additional value added services are included. Finally, with the growing demand for increasingly timely and reliable transportation services the trucking industry has been threatened from adjacent industries, most notably airfreight transportation. Yet, despite the changes in industrial structure mentioned, there seems to be remarkable stability in terms of the number of firms and in the level of concentration.

#### Industry structure and division of labor

Table 2 reveals a high degree of stability in the number of firms participating in the Danish trucking industry over the period studied here. This picture is consistent for most of the segments making up the trucking industry, as defined here. One exception is the freight terminals segment, which is also the segment where scale economies are most important.



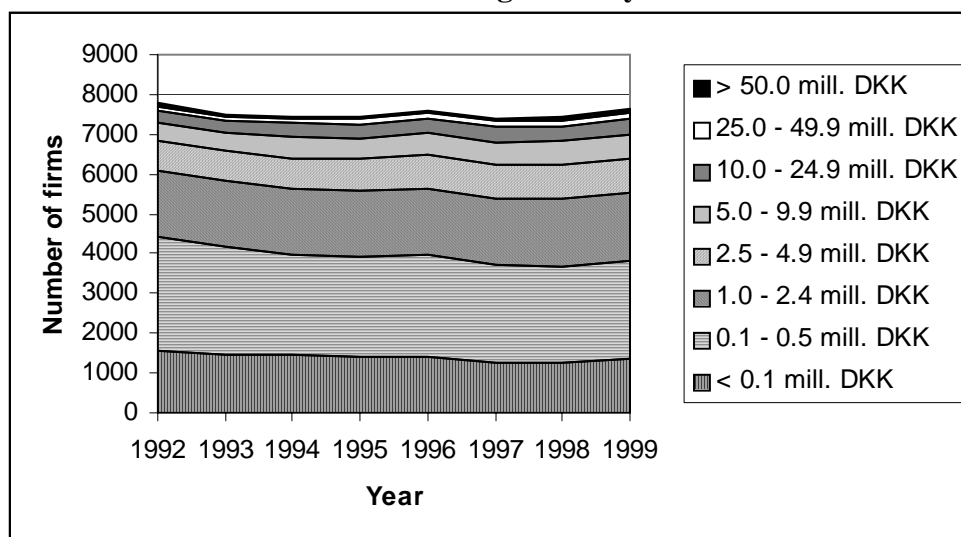
**Table 2: Number of firms in the trucking industry, 1992—1999**

Trucking industry	1992	1993	1994	1995	1996	1997	1998	1999
Trucking firms	6.454	6.219	6.138	6.079	6.224	6.093	6.104	6.245
Furniture movers	230	226	221	229	246	230	222	230
Goods handling	51	52	54	50	50	49	51	49
Warehousing	130	136	160	162	146	113	127	132
Freight terminals	101	98	87	88	72	68	72	68
Express couriers	806	781	783	829	856	849	850	901
<b>Total</b>	<b>7.772</b>	<b>7.512</b>	<b>7.443</b>	<b>7.437</b>	<b>7.594</b>	<b>7.402</b>	<b>7.426</b>	<b>7.625</b>

Source: Statistics Denmark 2004

Figure 1 shows the number of firms for each segment of the trucking industry divided into 8 different size distribution groups measured in annual revenues. It reflects developments in the structure and composition of the industry, which has been characterized by an overall dominance of small and medium-sized firms throughout the period studied.

**Figure 1: Firm Size Distribution in the Trucking Industry**



It could be argued that the predominance of SMEs demonstrates that economies of scale are insignificant in trucking. Indeed, whether or not economies of scale are important in this industry has been debated for about half a century now, and there are competing arguments on the issue (see, e.g., Roberts 1956, Dicer 1971, Keeler 1989, Elzinga 1994). Most agree, however, that scale economies can be reached at all output levels, and that they are basically attributable to differences in service quality. They are particularly important when freight terminals, chartering functions and local pick up and deliveries are involved in the offering. Thus, increased firm size should evidently result in an increased ability to produce high-quality services in parts of trucking.

The diverse economic changes relevant for trucking firms, and especially changing shipper needs and demands, are accommodated with different solutions, separating out carriers into different strategic groups or niches of the industry.<sup>4</sup> These groups cover the entire range of possible strategies, with cost strategies at the one end and service quality strategies at the other. Below we specify a range of strategic responses by Danish carriers directed at different segments of the market and associated with the vertical division of labor within the industry. Responses are strategic to the extent that they constitute a pattern of related practices and decisions concerning products and market positioning. Solutions differ significantly among the different carriers in terms of conception and legibility, tools, implementation, and performance. Overall, the structure of the trucking industry can be specified into four strategic groups reflecting generic strategies: Low-cost, differentiation, service quality, and advanced logistics strategies.

Low-cost carriers tend to be relatively small generalist firms operating one or a few standard vehicles, and usually economic efficiency does not increase with increased scale of operations. To keep down costs such operators typically offer only limited transport services, primarily the simple movement of goods from point A to B, and barter with shippers on spot market terms. The majority of low-cost carriers focus on door-to-door deliveries within a limited geographical area. The potential to cover a wider geographical area is limited, since low-cost carriers generally do not have the facilities to track and trace or to store the goods for transshipment. As a result, they serve the market segment where demands do not require such facilities, and each carrier tends to stay in this segment of the market. They either haul for a few customers on fixed routes within a limited geographical area or serve as a flexible elastic band for the medium-sized and large operators in peak periods. Low-cost carriers are usually price-takers, but as a result of demand uncertainty (the cyclic and changeable nature of demand) for certain types of goods coupled with their flexibility they are often able to obtain favorable charges.

Differentiation strategies characterize carriers specialized by technology, product segment, and geographical area (EC 1997a), and quality is typically an important element of such a strategy (EC 1997b). Specialization on a limited geographical area is characterized by operations between fixed terminals and via regular routes. Product specializations include reefer goods, dangerous goods, and high-value, low-volume items and require special handling and knowledge as well as dedicated equipment. The particular market segments, on which the specialists focus, are typically difficult to enter, since it takes time to become a specialist and requires specialized knowledge and dedication of resources and capabilities. Dedicated and specialized equipment is often

technologically sophisticated and in many cases the specialty carrier cooperates closely with shippers thus serving to increase the barriers to entry into the specified market segment.

Because of interaction effects (e.g., the need for specialized storage facilities and security systems) and technological indivisibilities some scale of operations is an advantage both for moving dangerous goods and reefer goods. Therefore, differentiation depends on a narrow focus on the chosen market segment and thus scope is not a viable solution. The scope of each differentiated company is furthermore limited by customer expectations. Thus, interaction effects and tight selection serve to maintain stability and act against diversification. Although there is no typical size for differentiated operators entry barriers in terms of scale are nevertheless relevant for the medium-sized firms to survive in the long run, because these firms are generally too small to compete in the market for advanced logistics and too dedicated and complex for price competition.

Operators following service quality strategies can be small, medium-sized or large carriers. However, because of demand uncertainty service quality strategies generally require both investments in excess capacity and some scale of operations associated with the use of specialized assets, so that size becomes a comparative advantage. Of course, to exploit economies of scale and scope small firms aiming at high quality services can share utilities with other firms. Such a strategy characterizes not individual firms, but rather networks of firms (see also below). Quality carriers typically focus on high standards in customer relations and reputation and their goal is to provide timely, reliable, and transparent services through standards specified in quality systems. Many of the medium-sized quality providers offer relatively low charges to their core customers (ITS 1997), which result from ex ante coordination through prior contractual commitments and personal relationships. This happens not in direct competition with low-cost carriers, since quality carriers can offer low charges only because of their widespread use of long-term close linkages with shippers. Because of high fixed costs together with a certain governance inseparability in high quality operations, service quality carriers can only compete on the flexibility measures important in the large general market for trucking to the extent they have excess capacity. Many quality carriers do have some excess capacity resulting from investments made to buffer against uncertainty without having to contract with owner-operators that cannot live up to the image required by the customers of the quality carrier. However, competing with low-cost carriers implies sunk costs related to the rigidities of investing in assets necessary for high quality operations. In the long run, competing on the spot market may well inflict warranty costs and reputation losses to the quality carrier.

Mainly the few large carriers and the international express companies adopt advanced logistics strategies, although some value adding logistics services can be part of differentiation and service quality strategies. The distinction of advanced logistics from differentiation and service quality is one based on the type and degree of diversification: advanced logistics operators are typically more diversified into logistics than differentiated and service quality operators. Large logistics providers usually serve a broad range of market segments and act on their ability to provide complicated solutions to a wide range of industries and for many different types of freight. Furthermore, personnel are dedicated to both specific tasks and to specific customers. Customers are connected to the company through particular individuals, such as key account managers, with whom they develop stable professional relationships. Logistics strategies thus require investments in advanced information and communications systems, human capital, high-capacity equipment and various types of vehicles. Partnerships with shippers and other logistics providers are essential to complete one another's geographical range and fill up the blank spots in Pan-European networks (EC 1997b) and overseas. While entering into Pan-European networks is a vital element of an advanced logistics strategy it also serves to increase interdependency among logistics providers and make each of them more vulnerable on specific markets, since the actions of the other alliance partners can largely determine whether or not and how one company continues to operate on a specific market.

How are firms interconnected within and across groups, and what determines the division of labor among them? Spontaneous spot market coordination, horizontal cooperation in networks, vertical quasi-integration, and unified ownership are all common organizational arrangements in the trucking industry. Interfirm linkages are believed to be a key factor in determining the operational structure of the industry (Sornn-Friese 2005) and at least part of the industry is heading for a multi-tiered structure (Abrahamsson and Wandel 1998) based largely on the strategies of the large firms that take over the responsibility for coordinating the activities. Especially, many small firms and owner-operators function as subcontractors for large carriers (EC 1997b, ITS 1997). In the following, we review the nature and extent of interfirm linkages in trucking.

The Danish trucking industry is characterized by a deepening of the vertical division of labor, with increasing interfirm cooperation as a main feature. A recent survey on cooperation in almost 4.000 Danish companies suggests that in the Danish transport sector 26 percent of all firms engage in ongoing cooperation with one or more other firms (Mortensen et al. 2004). 79 percent of the Danish carriers that engage in ongoing cooperation with other firms mention enhanced

flexibility as an important rationale for cooperation, while 71 percent mention external scale economies. Other important reasons mentioned include access to new markets (58 percent), lack of internal resources (54 percent), increased visibility (54 percent), development of new products and processes (46 percent), and access to technology and complementary capabilities (38 percent).

Different types of interfirm linkages can be identified in the Danish trucking industry (National Agency for Enterprise and Housing 2002, Sornn-Friese 2005). Loosely organized networks are most common among small and medium-sized carriers and are a kind of horizontal specialization in which participating carriers pool resources to obtain economies of scale (e.g., through sharing of utilities) and gain short-term profits. The professional association, Danish Transport and Logistics (DTL), has played an important role advocating and promoting this kind of cooperation among SME carriers.

Concept-based networks are developed around a common agenda. Usually, they center on sharing ICT systems, coordinating carriages and/or sharing marketing and sales. They exist in a number of slightly different forms. The most common is one based on electronic data interchange (EDI) and a shared organizational infrastructure where Danish carriers cooperate with foreign carriers to perform more complex, international shipments through a standardized hub-and-spoke system. The central hub in such networks is an organizational platform, which is essential to their performance. Concept-based networks also take the form of more traditional strategic alliances among a limited number of firms, and, more recently, in the form of so-called virtual trucking companies.

Distribution networks are formal and long-term and have a high degree of interfirm coordination in core and auxiliary activities. There is also a high degree of ownership integration in the sense that they are collectively owned and run by the participants. They engage actively in product and process innovation, often in project-based collaboration with suppliers.

Finally, hierarchical networks structure around a single large carrier (typically an advanced logistics operator) that subcontracts extensively with smaller carriers. Hiring owner-operators is a source of flexibility in managing capacity to meet demand. Given that the degree of ownership integration is low, it may be more appropriate to refer to this type of cooperative arrangement as a core network, where numerous satellite firms supply intermediate services to the core, which then effectively coordinates the network as a whole (Robertson and Langlois 1995). Of course, there may be a pitfall with this kind of arrangement related to quality uncertainty in transport: Owner-operators and smaller carriers functioning as buffer for the large carrier may have little or no

incentive or competence to honor the quality and service demands of shippers. Large and specialized logistics operators buying services from smaller independent operators are, of course, aware of this. The practice of buying out is thus ideally a strategic choice based both on calculations of cost and benefit and the desire to concentrate on and develop core capabilities. The alternative is investing in excess capacity. On this basis, one may argue that there are certain externalities connected with strategic group membership and restricting group membership over time.

While our data suggests that large firms have gained in importance within certain activities in the industry, it is also clear from the study that they are different from the integrated firms that are typical in oligopolistic markets. They are more specialized and far more embedded in market-like networks analogous to Marshallian industrial districts. Thus, in the production of trucking and logistics services large firms increasingly assume the role of systems coordinators.

### **Congress Tourism**

The Danish industry for meetings, incentives, conferences and exhibitions (MICE), which is part of the much larger tourism sector, is easily as difficult to define as the trucking industry. Like other types of tourism MICE can best be defined as a demand concept, which is inherently complex and subjective in nature. It is essentially the client (or, rather, the visitor) who defines the distinguishing characteristics of the product, not the producer. Current developments in the profile of clients (increasing multiculturalism, ethnic diversity, more female clients, more single people, more senior people etc.) add to these complexities. In fact, it is extremely difficult to determine which industries produce MICE and related services, simply because there are so many industries involved and because each visitor has unique requirements (e.g., to accommodation, dining, entertainment and professional activities).

In this paper, we focus on congress tourism, the market of which is a segment of a larger global market for meetings. A congress brings together people from different places to participate in some specified event. It can be understood as unique instances unfolding over time and produced and consumed simultaneously. As such, it falls within the experience economy framework (Pine and Gilmore 1999), providing insights as to the specific nature of the industry. Hotels (mostly with their own restaurants) and conference centers are the cornerstones in congress tourism and are therefore used as proxies for the industry in our analysis. The market for meetings can be divided into three segments: 1) companies, 2) governmental organizations and 3) nongovernmental organizations (NGOs). According to the Union of International Associations (UIA) the Danish

Congress tourism industry has a global market share in the area of two percent. Denmark is number 15 on the Top-20 list of preferred countries for international congresses (Strunge 2001), and Copenhagen entered as number eight of the Top-10 international meeting cities in 2004, exceeding both Berlin and New York (Davidson 2004).

A congress usually has three elements, which are all essential to the positive (or negative) experience of visitors. Firstly, there are the practical issues of chartering facilities and taking care of logistics. A widespread manifestation of the practical elements of arranging a congress is that the organizer usually has some affiliation to an airline as well an option for a number of hotel rooms (allotment). As the timeframe is always fixed timing is of the essence. Secondly, there is the professional element of planning programs and inviting keynote speakers. This element involves knowledge about specific areas of expertise (at some level), and is key to the successful carrying out of the congress. Finally, there is an indispensable social element, which is made up a number of entertainments and events and usually is based on exploiting local resources (e.g., visiting the Mayor's office) and attractions (historical sites, amusement parks, museums etc.). Obviously, the amount and variation of elements in a congress necessitates the participation of many and diverse agents. This makes the congress tourism business extremely complex. Also, it should be mentioned that each of the three elements mentioned above are necessary but not sufficient to ensure success. The total experience will never exceed the weakest link.

A number of ongoing developments in the market for meetings and conferences – including a tendency towards smaller, shorter and more frequent meetings, an increasing focus on company meetings and growing constraints imposed by demands for shorter lead times – influence the institutional structure of production in the congress tourism industry (Davidson 2003, 2004). The tendency towards smaller and shorter meetings and conferences is a result of cost-cutting efforts of the companies and organizations that procure congress tourism and related services. They do so by avoiding overnight stays as far as possible and by keeping the number of participants at a minimum.. This, of course, means that events become more work-focused and less flamboyant. One implication from this is that the individual visitor gets less time to take advantage of local resources and attractions and over time congress tourism as such may to some extent become easier to characterize as a single, homogenous product. Simultaneously, clients procure meetings and venues more frequently as they come to appreciate the need for more recurrent communications with internal and external stakeholders.

Demand for congress tourism and related services is increasingly complex and uncertain, especially as clients tend to shorten their planning cycles in this respect, and today an increasing number of clients postpone committing their budgets until the last minute. The market for meetings and conferences thus experiences a tendency towards shorter lead times, which demands increasing flexibility on behalf of hotels, venues and organizers.

Industry structure and division of labor

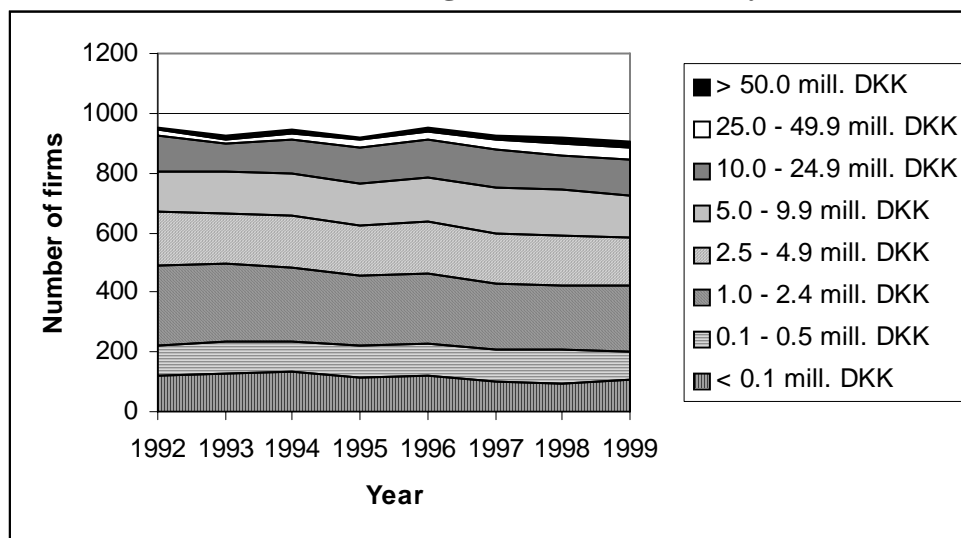
**Table 3: Number of firms in the congress tourism industry, 1992—1999**

Congress tourism industry	1992	1993	1994	1995	1996	1997	1998	1999
Hotels with restaurants	812	787	797	764	785	758	745	727
Hotels without restaurants	61	53	54	64	73	79	84	94
Conference centers	80	83	94	92	96	87	88	86
<b>Total</b>	<b>953</b>	<b>923</b>	<b>945</b>	<b>920</b>	<b>954</b>	<b>924</b>	<b>917</b>	<b>907</b>

Source: Statistics Denmark 2004

Figure 2 shows the number of firms for each segment of the congress tourism industry divided into 8 different size distribution groups. Like trucking, congress tourism is also characterized by an overall dominance of small and medium-sized firms and has been so throughout the period studied.

**Figure 2: Firm Size Distribution in the Congress Tourism Industry**



It could be argued that economies of scale are insignificant in congress tourism. As in the trucking industry, economies of scale are in fact important in parts of congress tourism, especially for hotels where branding and chain management has long carried competitive advantages as well as consumer benefits. Large firms may still play an important role in congress tourism, however. Large firms may act as price stabilizers (Strunge 2001). Innovative low-cost entrants and,



alternatively, existing small and medium-sized firms that start to offer lower-priced services do not threaten the position of incumbents.

The creation of a tourism product such as an international congress does not occur in a sequence of activities, but through the adding together of diverse products and services into an overall product. Output, therefore, is also extremely difficult to measure (Lickorish and Jenkins 1997). There is not a single physical output and the service-producing firms are not interrelated in a pecuniary sense. However, they are still interdependent in a strategic sense, illustrated by the following example.

Hotels produce overnight stays. To do so, the hotel needs to procure a number of products and services that are functionally related to the hotel's product (such as catering, cleaning and maintenance). In order for the hotel to attract visitors it also depends on the activities of a number of other agents not functionally related. Thus, to produce overnight stays the hotel is not directly dependent on the airline, the travel agent, the museum, the opera house or the amusement park. The dependency to these types of agents may nevertheless be considerable, since the hotel's sales opportunities very much hinge on the ability of those agents to attract congresses in the first place. The diverse agents involved in congress tourism offerings are weaved together in a small-meshed web of activities, where the activities of each agent accrue economic benefits to the other agents.

The different agents important to consider if we are to understand the processes and evolutionary dynamics of congress tourism are many and diverse. Hotels and conference centers essentially define how large a congress any city can attract, and at the same time their size must be in accordance with what a city of the size and type (large city, capital, metropolis) could be expected to attract. A large center in a small town does not guarantee the attraction of large conferences. Even the size of the congress sites is to some degree a result of interdependence. Accessibility is an important factor, the number and quality of air-connections and other means of transportation as well as the physical infrastructure of an area affect the extent to which it can attract a congress., Each of these types of agents exerts lobbyism and other means to influence central decision makers in congress markets.

Firms specialized in the role of coordinators, known generically as incoming bureaus, are very important in the tourism industry. . They differ from travel agencies in that they focus on bringing visitors to their home region. Those bureaus that have international congresses as their core business – known as professional congress organizers (PCOs) – specialize in organizing, managing and concluding congresses. Although the PCO typically has a number of regular

customers the market is a competitive one, where winning an assignment in close competition with other PCOs depends on expertise and product-mix.<sup>5</sup> They compete on who can provide the best experience at a given cost level, and references to previous conferences are important assets. Since they all have the same access to airports, public transportation, landmarks and other public goods in the region, these resources are homogenous and cannot be used to create competitive advantages unless they are a part of a package.

Another important type of agent in the congress tourism industry is the convention bureau, which is financed either by the authorities or through public-private partnerships. The convention bureaus are set up to promote the location (mainly cities) to firms, governmental organizations and NGOs. The bureau often provides the rallying-ground for bringing together the other types of agents in the industry in some form of collaborative venture. As such, it plays an important role in efforts to create and exploit strategic interdependencies. The convention bureau in Copenhagen is Wonderful Copenhagen Convention and Visitor's Bureau (WoCo), which has brought together a number of different agents in the network Meetingplace Wonderful Copenhagen-Malmø (MWCM). WoCo has developed a rather elaborate website where congress facilities, pictures of the region and an interactive map for determining locations for potential business ventures are all merged together. They promote the overall industry leaving the actual competition and co-operation to the congress centers. This illustrates how interdependence and competitiveness intermingle.

Finally, although not significantly influential in the congress tourism industry there are the suppliers and subcontractors for whom the event of an international congress has economic significance (e.g., local trucking companies and passenger carriers, retail, museums and other tourist attractions etc.) and who in return have an impact on the success of conferences and the scope of conferences being offered.

The above analysis suggests some of the structural complexities present. However, there is much more to this issue than can be revealed in simple description of structure and composition and external changes. While it is important to consider who are the relevant agents and how they interrelate, it is essential to reflect on what they do and why they do it. This includes analysis of complexity at multiple levels.

#### **4. Reflections on the Industry Case Studies**

In this section, we employ the two case studies to reflect on the type of questions raised in the introduction. We discuss the findings from the two cases and present a number of propositions

relating interfirm linkages to the vertical structure and dynamics of industry. Our observations are organized to match crucial aspects of the questions posed in regards to the internal and boundary conditions of the industry: sources of variety in demand, the characteristics of organizational tasks and routines, and path dependency and self-replication in the organization of industry. The two case studies highlight the importance of interconnectedness and interdependencies among firms in explaining the structure and dynamics of the industries.

A major finding from the case studies is that economic activity involving interfirm exchange and adaptation creates productive linkages among agents, which concurrently facilitate superior access to information in vertically related industries and allow for competitive advantage to be gained through flexibility. As a result, the market becomes gradually more organized and some of the firms' transaction costs are reduced. Furthermore, linkages become more articulate over time, potentially giving rise to 'network dynamic efficiency' (Nooteboom 1999). This notion reverberates the idea that industry structure is usually a complex web of interfirm linkages, the intensity of which in part depends upon whether the activities that characterize the industry are similar or complementary (Richardson 1972). Combining different degrees of similarity simultaneously with different degrees of complementarity outlines different patterns of industrial organization at any given time, highlighting the inherent complexity of industry structure and points to the intra- and inter-industry division of labor.

### **Sources of variety in demand**

A first industry boundary condition to be explored in terms of the two industries is the role of demand and the sources of variety in demand. Indeed, recent theorizing on industrial dynamics has pointed to the often-neglected, but highly important role of demand as a factor that may explain the structure, dynamics and evolution of industries (see, e.g., Adner and Levinthal 2001, Klepper and Thompson 2002, Malerba 2006).

The two case studies suggest that variety in demand is accommodated by a corresponding variety in organizational forms. An important characteristic of the industries is the intricate segmentation of demand and constant modification in the features of the offerings that are demanded. The different stages typically depicted in studies of industry evolution reflect specific demand conditions, the development of which is anticipated to follow an S-shaped growth curve. Few endorse the fact that demand may remain fragmented, varied and uncertain as an industry

evolves. However, both quantum variety and variety in form, which would tend to sustain a decentralized pattern in the organization of an industry, clearly characterize the two industries. Especially, an industry where demand is parametrically uncertain and structurally heterogeneous needs a flexible system of production to satisfy customer requirements. Narrow concerns about production efficiencies and organization design do not necessarily entail vertical or horizontal integration, when demand stays diverse.

Many industrial and consumer markets are characterized by demand uncertainty with major fluctuations in output. Demand uncertainty is fundamental to organization in the sense that in the short run, fixed costs preclude a firm's full adaptability to changing amounts of variable factors. With a decentralized industry structure, most costs are variable and output fluctuations do not affect revenues drastically. Outsourcing and subcontracting can therefore be efficient means for the individual firm to keep demand and supply shortages (and the attendant costs) at a minimum under conditions of demand uncertainty. In the trucking industry, this is seen most evidently in the larger carriers' extant use of owner-operators, which has been described as hierarchical networks. To the extent that demand uncertainty reflects on such organizational arrangements we would expect the larger carriers' use of owner-operators to fluctuate with peaks in demand as well as with the overall economy. This could be measured as payments to owner-operators as a percentage of the total operating expenses of larger carriers. In the congress tourism industry, it is seen in the hotels' and venue operators' increasing focus on smaller and more frequent meetings and conferences, where the requirements to flexibility are passed on to suppliers of various forms.

Demand heterogeneity is a significant source of uncertainty and volatility. It may take the form of constantly changing requirements of individual customers with whom a firm has established enduring linkages. In congress tourism, the sales and proposal process increasingly has to incorporate value added services involving direct contact with clients. Flexibility on lead and response time is an important issue here, but it can be no strategic parameter unless other rapport problems owing to misunderstandings can be overcome. So, customer relationship management becomes increasingly important (FutureWatch 2004). Demand heterogeneity may also consist in the servicing of a largely anonymous and varied market, where transactions with individual customers are characterized by unique requirements and low frequency. In both forms, a decentralized structure is a systemic and flexible response through which an industry can satisfy more closely the needs and requirements of individual customers. In the trucking industry, demand heterogeneity is accommodated by interfirm cooperation, especially in the form of concept-based networks and

distribution networks. The congress tourism industry also faces a high degree of demand heterogeneity, but of an even more intricate kind relating to the inherently complex and subjective nature of tourism as a product. Such intricacies call for a finer distinction between different sorts of demand heterogeneity, and a notion of demand complexity may capture better what is going on in congress tourism. The above considerations lead us to the following proposition.

Proposition 1: Sources of variety in demand create pecuniary and strategic externalities, which are crucial for explaining vertical specialization in an industry.

### **The characteristics of organizational tasks and routines**

The intricacies of the trucking industry derives from the many sources of information pertinent to the every day organization and performance of tasks and to pricing and strategic decision-making under variable and changing boundary conditions. These sources can be divided into 1) other firms in the industry, 2) customers, 3) relevant regulators, 4) workforce composition and skills, 5) the physical environment (infrastructure, vehicles, warehouses) as well as 6) weather conditions and 7) concerns about the natural environment (congestion, emissions, safety).

The nature of pricing decisions may illustrate some of this complexity (Scherer 2003). Trucking and related services are priced first of all by what the market will bear. If other things remain the same, the rate on a given load will be higher, the more valuable the commodity is per weight-unit. However, many other variables (such as the distances between nodes of origin and destination, the physical facilities at either of these points, congestion, the weight and cubage of the individual load, fragility and perishability, claims experience, transit time, whether or not the shipment must be interlined, track-and-trace and other additional services and more) must be considered.

Industry level characteristics thus reflect on the complexity at the firm level, where the variety of events and internal and external conditions and the ways they interact make information processing particularly difficult. The occurrence of numerous and co-dependent factors and events with potentially incompatible requirements operating simultaneously and changing over time illustrate complexity in this sense. Such complexity brings about transaction costs and thus has implications for economic organization. As such, it is important for understanding the vertical structure and dynamics of an industry.

In trucking firms of some size, administrative and operating tasks are divided between dispatchers and drivers. Dispatchers take orders from shippers, maintain customer services, design and schedule pick-ups and deliveries, allocate trucks and drivers, search for backhauls to utilize capacity, and motivate the drivers. Thus, dispatchers are knowledge workers engaged in problem identification, problem solving, and brokerage (Zuboff 1988). The capability requirements to dispatchers are complex and demanding, and with developments in logistics and changing customer requirements the pressure on dispatchers increases even more.

In pure form, load and route planning and vehicle optimization are fairly routine operations that involve largely codified knowledge, they can be improved by new ICT. Just-in-time deliveries organized around frequency, speed, and reliability in terms of fixed delivery times are more complex and demanding and cannot be automated as easily. However, even here codified knowledge is an important element, especially when the operator serves regular customers. Consolidating loads from multiple customers with multiple interests concerning availability, reliability and services from end to end is the most complex, dynamic, and demanding situation and requires top-notch capabilities and suppleness of dispatchers. In these situations both routines and unforeseen events are important aspects of the operation. Implementation of ICT may reduce some of this complexity. However, we can assume a priori that it will in fact reduce all uncertainty. Indeed, adoption of ICT will likely lead to new complexity in the interaction with customers (e.g., these may require further reductions in average shipments sizes). With the most complex situations, the time horizon tends to be short-term and planning typically occurs on a day-to-day or even hourly basis.

This means that dispatchers have to deal with very concrete details where tacit knowledge is crucial. Here, internalization of productive knowledge through in-house training of personnel (common to the trucking industry) can be seen as a substitute for detailed centralized planning. This is reflected in the simplification of authority and communication structures in trucking firms. As discussed in the above section, trucking firms of a certain size must continuously evaluate and act on changing demand requirements, especially when these occur with existing customers, and they must retain a high level of flexibility.

Mounting task complexity also faces firms in the congress tourism industry. This is especially evident for PCOs who take care of all the practical elements in carrying through an international congress.<sup>6</sup> Often, the PCO is also involved in the financial management of a congress such as, for example, finding sponsors (e.g., international meetings of medical association are often

sponsored by bio-medical companies). By assembling a number of services of diverse individual suppliers the PCO tailors the specific product (i.e., the congress) according to the requirements of the individual client.<sup>7</sup>

The nature of interdependencies in the congress tourism industry has implications for competitiveness and industrial dynamics, which will depend on the combination of individual and collective performances. While the individual performance of tourism firms fall back on their ability to create productive capabilities and increase their efficiency, collective performance depends upon the entire system of firms and other organizations in congress tourism. Individual performance may for some, but not necessarily all firms rely on cost-reducing innovations and the exploitation of economies of scale. As significant to augment the overall competitiveness of destinations, however, is the level of collective performance. The ability to create and exploit shared or higher-order industrial capabilities (Foss 1996) is important here. In this setting, the existence of a well-functioning institutional framework (in the form of standard-setting and other means to enhance coordination at the level of the destination and reduce the likelihood of shirking and other kinds of opportunistic behavior) is a key to collective success.

Proposition 2: A high degree of task complexity, which follows directly from the sources of variety in demand discussed above, is a major determinant in the formation of flat organizational structures and horizontal labor mobility in an industry.

While task complexity creates a need to engage in interfirm cooperative arrangements and as such drives the vertical division of labor within the industry, it also results in increasingly distinct internal organizational structures and processes in the individual firm and this is paramount to the success of interfirm cooperative arrangements in the first place. The literature on modularity may help inform us on the coordination mechanisms involved here.

### **Path dependency and self-replication in the organization of industry**

We take the problem of how firms acquire the capabilities pertinent to the productive opportunities they face when boundary conditions change as essential to understanding the vertical structure and dynamics of industries. Taking advantage of those opportunities does not necessarily entail integrating (or accumulating) the needed capabilities in one firm, even if simple transaction cost consideration would favor integration. The actual response to changing boundary conditions is

necessarily complex and historically contingent (Langlois and Robertson 1995). Suppose that, when economic change calls for a realignment of firms' capabilities, the economic change in question can revolve around the lines of an existing or a developing division of labor within the industry (Langlois 2003). In such a situation, the vertical scope of an individual firm co-evolves with the vertical structure and division of labor within its industry.

The generative role of externally distributed capabilities has been somewhat overlooked in the literature, but it is quite important to the understanding of connections and interdependencies among firms and their role in reinforcing or deepening the existing vertical structure of an industry under changing circumstances. In the industrial organization literature, the configuration of interfirm linkages and complementarities is seen to reflect the vertical structure of an industry, but not be intrinsically involved in its making. Here, external economies are likely reducible to what Skitowski (1954) called 'technological external economies,' referring to the capabilities of other agents that reflect the given state of technology within the industry. In this picture, external capabilities are created exogenously and most firms within an industry would be passive reactors to changing boundary conditions.

Economic change usually creates a need for the individual firm to reconsider the scope of its activities and any firm is likely to follow organizational strategies that reduce the uncertainty and transaction costs caused by economic change. One such strategy is to focus on core competencies (Prahalad and Hamel 1990). Comparative advantage dictates that a firm can gain from outsourcing even profitable activities, if only the external distribution of capabilities in the industry can complement or displace internal organization. Opportunities from importing capabilities developed in other parts of the industry may even enhance further the gains from specialization into one or a few areas of production. These considerations lead us to our third and final proposition.

**Proposition 3:** If the configuration of capabilities and interfirm linkages in place within an industry can accommodate for the change in boundary conditions, then the dynamics of the industry are likely to revolve around and enforce its existing structure.

It should be noticed that heterogeneity in the externally distributed capabilities is a necessary, if not sufficient, condition for maintaining a vertically specialized industry structure. If, for example, no other firm within or outside the industry is capable of making the investments necessary to accommodate the needs of the focal firm, the focal firm is forced to integrate or develop the needed capabilities internally. On the other hand, if other firms have evolved into highly capable suppliers



the prospects for increasing outsourcing is good. In this sense, the vertical structure and dynamics of an industry become historically contingent and path dependent.

To the extent the capability configuration of an industry encloses interfirm complementarities, it can potentially explain how firms interact and how the result of this interaction is a joint higher-level outcome, intended or not. If such complementarity is a mechanism for maintaining organizational stability in an industry over time, it must allow for firms to reduce transaction costs and, at the same time, to acquire the information relevant to respond to temporary changes in boundary conditions. Our industry cases suggest that externally distributed capabilities entail different kinds of interconnections and interdependencies among firms in and around an industry, each of which is potentially important for understanding the industrial structure and dynamics. We wish to emphasize the historical dimension; the prospective influence of the existing structure of an industry for ensuing dynamics that may lead it to behave uniquely. These are:

- The particular nonmarket interdependencies among firms in an industry, where the output of one firm is influenced by the behavior and activity of other agents in ways other than through their offering of services used and through purchase of products. These create dynamic linkages between small and large firms in an industry important for the ability of the industry to cope with change and uncertainty. Rothwell (1983) referred to these as ‘dynamic complementarities’ to capture the differences in innovative ability between small and large firms.
- The strategic interdependencies among agents in an industry that summarize an important instance of institutional influence on the vertical structure and dynamics of certain industries.
- The pecuniary interdependencies that arise over time and are normally known as external economies. Marshall (1932) defined external economies as the advanced and historically determined division of labor that depends on and characterizes the state of an industry and accrues economic benefits of belonging to that industry.<sup>8</sup> External economies thus consist of interfirm and inter-industry linkages unfolded through earlier processes of externalization of economic activities.

## 5. Discussion and conclusion

Our study has inquired into the issue of how firms in an industry socially and historically interrelate so as to maintain the efficiency of the industry and thereby reproducing its organization over time. It has not been our purpose to imply that formal modeling of the processes of industry evolution based on simple representations of firms cannot be applied. We do declare, however, the importance of inquiring deeper into the actual processes and dynamics leading industries to organize and behave differently. It is our contention that giving careful attention to interfirm complementarities and dynamics is a fruitful way to do so.

Promising attempts at informing industrial dynamics as socially and historically determined have been made, which point to the importance of seeing industries as dynamical systems and studying the role of different types of organizations and institutions. Examples of this line of inquiry have been presented as structural evolution (Malerba and Orsenigo 1996) and history-friendly modeling (Malerba et al. 1999, Malerba and Orsenigo 2002). We believe that the groundwork laid out in this direction is essential to understanding the structure and dynamics of industries. We need to view industries as inherently dynamic systems operating in historical and chronological time and as such subject to wider institutional influence.<sup>9</sup> Such systems are open in the sense that they exchange resources and information with their external surroundings and they have diverse temporally and spatially interrelated agents that carry out various unique activities. Furthermore, the relevant economic competence embedded within the industry is necessarily local in the sense that it is path dependent and develops in close proximity to the activities being performed) and distributed.

It should also be recognized that the behavior of firms is determined largely by the decision rules they have assumed and which, over time, are adjusted in response to what they have learned from experience or from what they perceive to be best practice in their industry. In this respect, firms are best understood as knowledge-based entities the functions of which are cognitive. In this view, firms must direct and align historically created perceptions, knowledge and assessments to be effective. The greater the extent of internal and external complexity and variety, the higher is the need for focusing.

From Marshall (1932) we may infer that, when looked upon as a dynamical system, an industry is characterized by increasing transaction costs and an increasing need to process information and create new knowledge as it evolves. Such transaction costs, which cannot be

reduced to any single level of analysis, can be defined in informational terms. They are a function of the readily and potentially available information necessary for agents to understand what is going on in their industry. The more potential information (which again is a function of the number and variety of agents) inherent in an industry, the more complex this industry is. Information thus plays a fundamental role in the dynamics of industry evolution (Clark 1991). A firm can also be (too) complex on a number of dimensions, including the number of products and services it offers, the variety and types of markets it serves and the number of activities it undertakes. Finally, products and services may themselves be increasingly complex in the sense that they embody an increasing number of components and subsystems and require an increasing range of forms of specialized knowledge.

Insisting on seeing firms and industries in such a way implies an explicit organic view, in which important linkages between economic agents are both internal and external to the industry and where the characteristics of any agents hinge on their linkages to other agents. Such a view, in which interfirm linkages provide the ligament of industry morphology, is entirely consistent with a neo-Marshallian economics of industry. To our knowledge, only few have studied in detail the role of interfirm connections and interdependencies in the structure and dynamics of industries. In highlighting the generative significance of such linkages in industry evolution Malerba and Orsenigo (1996) is an exemplary exception.

Another example is the study by Gemser et al. (1996), which explicitly links interfirm linkages to the life cycle of a competitive industry. According to this study, linkages between firms are formed and ended almost perfunctorily to cope with the conditions of the different stages of the industry life cycle. This view, however, essentially misses the point that linkages are themselves involved in the change and dynamics of industry structure. Indeed, we need to ask if any configuration of interfirm linkages is an outcome of general economic forces, as their study seems to suggest, or if it is a socially and historically determined outcome of prior such configurations and the purposeful strategies of individual firms (e.g., outsourcing or strategic alliances). Considering interfirm connections and interdependencies as indeed a social mechanism in industry evolution Hicks (2001) shows how interfirm linkages are involved in product innovation in the telecommunications industry. He properly notices that cooperative linkages ‘emerge as forms of organizational innovation that could well be even more consequential for the future of the industry than the technological innovations developed in R&D labs’ (p. 164).

At number of research openings follow from our analysis. First, if we can answer how (and when) an industry becomes an organized system, we may be able to explain in more detail, and with greater predictive ability, why industries tend to evolve along different evolutionary tracks. We consider this to be an important area for future research. A different line of inquiry would consider how industries performing under conditions of demand variety in order to stay flexible create and sustain dynamic complementarities by improving even further the ability to solve interfirm coordination problems.

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## Endnotes

<sup>1</sup> By vertically divided and specialized industries we mean industries that can be decomposed into different subsystems each consisting of firms, which undertake activities that require similar capabilities (Richardson 1972). When the activities of firms in an industry require different, but complementary capabilities then the industry will consist of different subsystems.

<sup>2</sup> This is clearly a manifestation of the more general proposition that firms faced with critical problems of instability and flexibility will find it inefficient to teach staff rules for processing information and channeling communications (Stinchcombe 1959). This is especially difficult when volume, product mix, and labor composition change rapidly.

<sup>3</sup> The true contestability of this market segment lies in the fact that foreign operators in Denmark and Danish operators in other EU countries can enter the market offering very low prices as an alternative to empty backhaul and in principal exit the market soon after with no fixed costs involved.

<sup>4</sup> The groups are, however, somewhat interdependent. For example, some operators in one group to some extent must rely on external economies in the form of the flexibility of service providers that analytically belong to another group. The interdependence of firms across groups associates with the division of labor within the industry. The mutual dependence is largely functional and may serve as an explanatory factor in the performance of the industry as a whole (see also below).

<sup>5</sup> Some organizations and associations ally with a regular PCO, so that they can specialize in carrying out the professional elements of the conferences they plan. There is also an increasing tendency to outsource the practical elements to PCOs and as with outsourcing in most areas of business this tendency is followed by a related tendency towards single sourcing.

<sup>6</sup> The customer typically sets up an organizing committee (of 3-6 persons) with whom the PCO negotiates.

<sup>7</sup> Linkages to suppliers are usually governed by formal contracts. This is believed necessary because there are so many different types of agents and so many forms of agreements. Written contracts with the suppliers enable the PCO to control the event and to settle accounts when the congress is concluded.

<sup>8</sup> Marshall's notion of external economies has primarily been used to explain localized clusters of economic activity such as the industrial district. However, to Marshall external economies clearly were not a spatial concept, but rather a set of factors subordinate and secondary to other factors, which govern location in the first place (Phelps 1992).

<sup>9</sup> This would qualify the discussion in two important ways. First, there is the issue of learning; over time firms may learn how to deal with transaction cost related problems and design organizational mechanisms accordingly. Second, events are historical and influence economic behavior in a path dependent way.