

COGNITIVE COORDINATION, INSTITUTIONS,
AND CLUSTERS:
AN EXPLORATORY DISCUSSION

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I. Introduction

The present paper is an early attempt of conceptualizing the existence and dynamics of *industrial clusters* in a perspective that, while focusing on cognitive issues, also draws inspiration from game theory and organizational economics. The paper is unabashedly speculative and strongly exploratory, but illustrates its basic ideas with an empirical case.

The cluster perspective, which will be summarized in section II, is a quite heterogeneous one. However, it generally portrays *systemic relations* between organizations as the cornerstone of local social and economic development. Allegedly, such relations allegedly facilitate competitive advantage through the emergence, maintenance and development of strong external economies, for example the forms of flexible specialization and innovation in interaction between firms and their environments. The literatures on *regional innovation systems* and *industrial districts* are closely related to the cluster literature, drawing upon similar arguments, and often describing regional innovation systems and industrial districts as different types of clusters.

While some parts of the cluster literature are fairly practical and concentrate on empirically illustrating the impacts of service providers and universities on firm-level innovation rates, there is a growing literature with an approach to the regional context of innovation processes that is more taken up with conceptual and theoretical development. Even if these scholars rarely use the term, we may say that they are preoccupied with describing the industrial structures and institutions that best facilitate the *coordination* of strategies and activities of multiple agents within regional systems of firms. Particular attention has been devoted to the problems of coordinating economic interactions between business entrepreneurs — spanning from vertical supplier relations to horizontal strategic alliances or collective action.

The cluster literature is rich in interesting proposals, mainly based upon case studies. It has, however, been accused of a lack of clear theoretical concepts and of making empirically unsubstantiated claims (see, e.g., Casson 2000; Markusen 1999). While some of these weaknesses must be ascribed to the relative young age of the cluster perspective, it is true that few scholars have sought to provide theoretical accounts of, for example, the well-functioning market coordination that they claim to observe in regional agglomerations of firms. To us, it seems obvious that the cluster literature would benefit from incorporating more theoretical insight into issues of

coordination, and the present paper is an early and speculative attempt of infusing some economics and game theory ideas into the cluster literature. A natural source for such insights would be the economics of organization, that is, the well-established economics literature on the organization of economic activities across contracts and governance structures. However, the contemporary core of economics of organization — transaction cost theory, agency theory and incomplete contracts theory — does not provide sufficient insights into all issues of coordination. This is why we also draw on communication theory, knowledge-based approaches to firms and markets, as well as some game theory ideas.

For quite some time, organizational economics scholars have devoted most of their attention to unpacking one particular category of coordination problems, namely problems of *cooperation* between agents that may arise as a consequence of asymmetric information and self-interested behavior. The cluster literature may benefit — and has already benefited to some extent — from this theoretical insight in understanding how particular institutions facilitate cooperation amongst local entrepreneurs. However, the economic organization literature still pays relatively little attention to coordination problems that do not turn on misaligned interests, but rather on agents having incomplete, incorrect or different beliefs about each other or differing knowledge about particular tasks — what we shall call *cognitive coordination* problems. We argue that the economics of organization has neglected cognitive coordination at its own peril, because of its importance for processes of interaction, including innovation processes. The two types of coordination problems and their solutions are clearly related; for example, cognitive coordination may imply that entrepreneurs form positive beliefs about each other which in turn lower transaction costs and facilitate trade and specialization. However, often it makes sense to consider cognitive problems and the solutions to these in isolation. For example, in innovation processes, when cognitive coordination means that entrepreneurs share a language or “code book”, communication and knowledge sharing costs are lowered, possibly boosting the rate of interactive innovation.

The central argument of this paper is that *not only does a cluster function as a structure of incentives that is defined by explicit and implicit contracts and by reputation and competitive mechanisms, it also facilitates cognitive coordination by defining specialized cognitive categories and by singling out certain solutions to coordination problems as dominant ones*. We provide a theoretical account for what cognitive coordination is and how it may come about in a cluster. The paper is structured as follows. Section II presents the cluster perspective, and identifies the industrial activity areas in which a cluster benefits from market coordination. The section deals with horizontal and vertical relations between firms in turn. Section III then discusses the

incentive-related and cognitive aspects of coordination, arguing that cognitive coordination achieved through shared knowledge of entrepreneurs is a central form of coordination within a cluster, and may allow for both communication and interaction with low transaction costs. Section IV addresses the *processes* of cognitive coordination, how shared knowledge comes about. It describes how entrepreneurs may build knowledge jointly with partner firms, and how shared knowledge may also be a cognitive social institution, namely as a set of *focal points* that ease the process of interaction. In section V, we argue that focal points often come about through *analogy making*, and that analogy making has both information costs and cognitive costs. This renders the amount of shared experiences of entrepreneurs and the density of social learning processes within a cluster central for its level of cognitive coordination. Finally, section VI presents an empirical example of how cognitive coordination may look like and how cognitive coordination may come about in a cluster, circumscribed by social learning processes.

II. Industrial Clusters and Coordination

Industrial clusters

The cluster perspective is developed in a growing heterogeneous literature of both a theoretical and an empirical nature (see e.g. Arthur 1990; Anderson 1994; DeBresson 1996; Staber et al 1996; Rosenfeld 1997; Steiner 1998; Roelandt and Hertog 1999, Porter 1998; 2000; Schmitz 1999; Hill and Brennan 2000). The perspective rests upon the heritage of thinkers such as Smith (1776), Marshall (1891) and Schumpeter (1934), and sometimes comes with an Austrian economics flavor (e.g. Hayek 1937). More explicitly, it draws upon recent literatures such as the national innovation system perspective (e.g. Lundvall 1992; Nelson 1993); regional studies; and economic geography (e.g. Piore and Sabel 1984; Scott and Storper 1986).

A cluster can, in its most basic form, be described as a relatively bounded and geographically proximate group of firms between which there are *systemic relations*. Some scholars (e.g. Edquist 1997) focus upon how a cluster may promote quite wide-ranging process and product innovations. Others emphasize that systemic firm relations in a cluster also facilitate variety and flexibility when firms (re-) combine their knowledge through flexible supplier arrangements and hence “avoid lock-in to a given technology” (Storper 1992: 62). Clusters are often seen as particularly *successful* groups of firms (i.e., with above-average economic growth), even if this assumption is sometimes not made explicit, and is difficult to test empirically.¹

¹ For example, evaluating whether a system of firms experiences “above average” economic growth implies difficult exercises of determining the system’s exact

One subcategory of industrial clusters is dubbed *regional innovation systems*. The literature on regional innovation systems (for example, Asheim 1997; Asheim and Cooke 1999; Braczyk et al 1998; De La Mothe and Paquet 1998, and Edquist 1997) often takes a very explicit focus upon geographical proximity, and, indeed, technological innovation. In describing regional innovation systems, most scholars include a range of local public or semi-public local organizations that support firm-level innovation. Indeed, some of the regional innovation system literature is preoccupied with correlating regional innovation rates (for example, as measured by patent data) with regional infrastructures that are seen as particularly supportive for innovation — notably, universities and other providers of research and knowledge-intensive services. A strand of literature that addresses innovation with more of an emphasis on theory development claims that local social institutions, such as social conventions and culture, are also central to the nature of a regional innovation system.

The cluster perspective is also related to — and often borrows from — the literature on *industrial districts* within regional studies (e.g. Becattini 1990; Brusco 1992; Bianchi 1993). According to this literature, industrial districts are clusters that are particularly geographically proximate and institutionally “thick” (Amin and Thrift 1994). Relatedly, scholars point to the importance for clusters of *social capital* — (regional) configurations of social relations and social conventions — that are particularly conducive to economic welfare (e.g. Burt 1992; Maskell 2000).² Some have argued that such institutional structures may be analyzed as rent-yielding resources that are shared in a group of interacting firms but may nevertheless be costly to imitate for firms that do not belong to the cluster (e.g., Foss and Eriksen 1995; Maskell et al. 1998)

Clusters Facilitate Coordination

We accept the claim made in the literature that it is possible to distinguish clusters of firms with systemic properties, i.e. carrying out (some) endemic activities. Rather than going into the debate of whether firms in a cluster are more successful — for example, regarding innovation — than other firms, the paper concentrates upon casting some light on the distinguishing features of a cluster. What is it that makes a cluster different to the “outside world”? Our central notion is that a cluster emerges to the extent that a group of agents establish — intendedly and/or un-intendedly — mechanisms of coordination that strongly reduce the various transaction costs involved in the process of

boundaries and finding relevant sectors and markets to which to compare it.

² See Woolcock (1998) for a review of the social capital literature.

coordinating the process of innovation between legally independent firms, and where these coordination mechanisms are specific to the set of geographically bounded agents.³ This means that clusters are able to rely on market mechanisms to a very large extent. Market coordination works in both the horizontal and the vertical dimensions.

Horizontal coordination

First, some clusters manifest particularly strong and well-developed *horizontal* market coordination between firms that are specialized within similar activities.⁴ Horizontal specialization often leads to agglomeration economies, in the guise of a) specialization of local labor markets (specialization of local education bodies, attraction of skilled labor, and boosting skill levels within some fields through education and on-job training); and b) rich local infrastructures of supporting associations and specialized service providers (private firms, plus public service providers, such as research institutions and universities). Some of these agglomeration economies can arise spontaneously when many local firms carry out similar activities and demand similar services. However, the creation (and maintenance) of many supportive infrastructures demands local entrepreneurs to coordinate their actions (Schmitz 1999). For example, joint action of entrepreneurs is necessary to run local trade associations; change local course offers in education institutions; or influence local policymakers.

Another aspect of horizontal market coordination is technological spillovers. Technologies and designs have a propensity to spill over between firms that share basic technologies and training background of managers and employees, through monitoring and imitation or even active knowledge sharing (von Hippel 1988) or R&D collaborations (Foss and Eriksen 1995). Some spillovers may simply accompany co-location of firms with related activities and technologies, for example, in the form of informal know-how trading (von Hippel 1988). Formal knowledge sharing or R&D collaboration are ambiguous and risky activities that often involve substantial contractual hazards. Such activities pose particularly strong requirements for coordinating mechanisms and institutions.

Vertical coordination

Second, many clusters are also *vertical* systems of firm relations, i.e. value

³ An economist would argue that these mechanisms are “semi-public” or “club goods.”

⁴ This often means more specialized than just in the same industrial sector. Further, some activities of firms may also cut across traditional sector boundaries.

chains. A part of the capacity of a cluster is in fact to facilitate a continuously expanding specialization between firms, fostering learning and scale advantages within single firms. Vertical specialization and value chain relations may further boost user-producer innovation (Lundvall 1992). Value chains with flexible supplier relations — i.e., flexible specialization — also facilitate flexibility of the single firms and raises their product offer, but also demand that firms are able to quickly find new partners and collaborate with low transaction costs. This also necessitates coordinated behavior. We consider this next.

III. Coordination: The Roles of Incentives and Beliefs

It is a quite common theme in the literature that, somehow, clusters coordinate firms' action, for example, by reducing uncertainty (e.g., Camagni 1991). The exact mechanisms by which such coordination is accomplished are, however, seldom spelled out, although a few contributors have tried to establish typologies over these (e.g. Foss and Eriksen 1995; Lazaric and Lorenz 1996; Foss and Lorenzen 2002). We here distinguish between coordination problems that primarily relate to how to align the differing incentives of the parties and problems that relate to how to make agents choose strategies so that they implement a preferred equilibrium, irrespective of any incentive conflicts.

Incentive Coordination

First, reputational effects may work to align interests and behavior amongst local entrepreneurs. Regional systems of social rules and conventions — for example, on how to cooperate and share knowledge — and social sanctions against those who breach these conventions can be a very efficient way to avoid opportunistic behavior within the relatively bounded group of local entrepreneurs who depend upon each other's future collaboration. These mechanisms are likely to work smoothly in clusters, precisely because of the geographical bounds on the group of interacting agents. Another regional mechanism that can align the interests and behavior of local entrepreneurs is the existence — at least in some clusters — of local facilitators, professional mediators or organizations that specialize in coordinating new partnerships between entrepreneurs. Such coordinated activity facilitates business that would otherwise under uncertainty be risky or expensive in terms of transaction costs — for example, inter-firm collaboration with high sunk costs, or knowledge sharing with potential competitors.

However, Foss and Lorenzen (2002) point to the somewhat neglected, but nevertheless obvious point that the coordination of behaviors does not always hinge upon providing the right incentives. In fact, it is usually in the interests

of regularly interacting firms to cooperate and refrain from opportunistic behavior (as noted already by Macaulay 1963); their relations are governed by implicit, self-enforcing contracts. Such implicit contracts may be generalized so that a cluster is governed by an overarching implicit and opportunism-reducing contract. However, even if such implicit contracts exist, there may still be other kinds of coordination problems left. In game theory terms, the kind of incentive related coordination problems that we have just briefly discussed are often called “cooperation problems”. The kind of coordination problems that do not turn on misaligned incentives are usually simply called “coordination problems” (of “pure” or “impure” varieties). We consider these problems next.

Cognitive coordination

Lazaric and Lorenz (1996) point toward a second mechanism that reduces uncertainty in a cluster and coordinates behavior, namely that firms may control *shared knowledge*. A shared technological language can allow for “transcoding” (Camagni 1991) between firms, i.e. make them understand each other’s technologies, methods, etc. Another type of shared knowledge may be entrepreneurs’ common strategies of how to behave and collaborate. This shared knowledge align their behavior — as well as expectations as to their partner’s strategies and behavior. This type of shared knowledge thus has a large potential for facilitating cooperation.

When shared knowledge, which may result in convergent expectations (plans, strategies), facilitates the coordination of behaviors, we may talk about *cognitive coordination* (Foss and Lorenzen, forthcoming 2002). Cognitive coordination may also take place *within* a particular organization. For example, rules and routines — i.e. shared knowledge — are typically developed within firms and corporations. Indeed, according to some writers (e.g., Kogut and Zander 1993), this is what distinguish them from markets, in terms of coordinating communication and behavior of agents (who, in this case, are employees). The argument is, simply put, that employees of a firm will understand each other better and trust each other more than agents in the market. Much critique has been raised against this argument, pointing both towards the fact that there may be considerable coordination as well as cooperation problems within firms, and towards the high level of shared knowledge and coordination taking place in some markets, i.e. between firms.

We agree with this critique, because we argue that cognitive coordination is empirically a central ingredient of a cluster and that such cognitive coordination rests upon a basis of shared knowledge that serve as focal points for the coordination of actions (Foss and Eriksen 1995). Here, shared knowledge and cognitive coordination has two main impacts upon innovation. First, shared strategies can make entrepreneurs cooperate. Second, shared

code books can make them understand each other, and hence benefit from the information they get through their cooperation. Although much of the relevant literature has been alert to the importance of such shared knowledge, little attention has been devoted to the processes that result in this knowledge.

IV. Processes of Cognitive Coordination

If shared knowledge provides cognitive coordination, how does shared knowledge come about? What is the character of such processes of institutional development? And, once created, how exactly does shared knowledge effect cognitive coordination?

Shared knowledge through collaboration

Two firms may come to share knowledge through their direct relations to each other. For example, in the course of a collaboration, they may learn about each other's processes, and become better in understanding each other's technologies. Thus, they may develop what Loasby (1998) calls "indirect capabilities." This may form the basis for adopting the partner's technologies. Further, they may learn about each other's interests and strategies, and align these over time (Håkansson 1989), gradually creating *partner-specific trust*.⁵ However, building shared knowledge through relations between firms is a process that is costly in terms of both time and effort. This is why some entrepreneurs choose to rely on trust that has already been formed outside the business sphere, hence limiting much collaboration to networks of families, friends, or friends' friends.

Focal points

Shared knowledge may, however, also derive from the broader social context in which entrepreneurs find themselves. Different firms may be able to communicate about some technical issues when their staff share formal educational background, for example, they have are engineers. In a cluster perspective, provision of such shared code books for coordination between local firms is one important effect of regional educational institutions, like universities. However, many issues, even of technical nature, have a large content of tacit knowledge, and their communication between firms demands a shared practical know-how rather than similar formal education. A cluster

⁵ Note that when we speak of trust here and in the following, we do not refer to the kind of trust that exists to reduce problems of opportunism. Rather, the trust considered relates to believing that another person meets a certain level of competence with respect to his contribution to joint activities or the services that he is carrying out for a principal.

constitutes a regional production system where firms are specialized within similar industrial activities, meaning that local firms may have a range of similar practical experiences. Further, as firms are connected in complex and shifting local production networks — and are able to monitor each other — social processes of learning (Bandura 1977) raise their general level of shared experiences and common knowledge about core technologies. All this means that firms within a cluster are often able to understand each other’s technologies to higher degrees than outsider firms.

In a cluster, social learning processes may also result in common strategies amongst local entrepreneurs, what Schelling (1960) refers to as *focal points*. Focal points can function as code books or as common strategies to apply when interacting. Focal points that are shared by a large group of entrepreneurs can thus align their general behavior and expectations, stimulating *social trust* (i.e. trust that is not partner-specific, but mutual between all members of a particular group). Social trust thus hinges upon cognitive coordination, as managers have aligned positive expectations about each other and *ascribe* trustworthiness to each other on the grounds of membership of the group as a supplement to (or in some cases as a substitute for) personal knowledge of each other.

In the following, we further aim to unpack the social learning processes that result in cognitive coordination. The argument we make can be applied to cognitive coordination processes in general, but is applied here to a cluster to explain why particularly dense patterns of shared knowledge and relatively high levels of cognitive coordination may evolve in such regional contexts.

V. Social Learning and Analogy Making

Social learning and geographical proximity

A strategy becomes routinized when an agent experiments and re-applies the strategy that is relatively efficient. However, in a cluster, all agents need not rely on their own personal experience with a full specter of strategies, rather, the learning processes of most of them consist of *imitation* of neighbors rather than experimentation: They imitate the observed successful strategies applied by others. Through social learning, common focal points becomes institutionalized as “meta-routines” in a cluster, hence allowing the population of local entrepreneurs to coordinate their expectations (Bandura 1977). Social learning processes work smoothly between entrepreneurs in a cluster compared to the outside world, because of an abundance of strong and weak ties (Granovetter 1973), facilitated by the geographical proximity of local entrepreneurs. Proximity promotes face-to-face interactions along with monitoring and gossip, and hence shared experiences and points of reference. A geographically proximate production system that experiences growing

economic activity, specialization and inter-firm cooperation, also increases its number of inter-firm interactions, and hence the prevalence of shared focal points within a cluster may grow over time.

Focal points as analogy making

But what determines which focal points will evolve in a cluster? We shall argue that *analogies* to earlier interaction situations are particularly important here.⁶ In our argument, a focal point — i.e., a shared strategy — arises when a whole group of agents make similar analogies. For example, the shared strategies and expectations that leads to social trust can be seen as constituting similar analogy making by a group of entrepreneurs: They all ascribe trustworthiness to each other on the ground that they belong to a particular social group (they are locals). This is the same type of analogy as a patient makes when he trusts a doctor, not because he knows him as a person, but because he ascribes trustworthiness to doctors in general.

Some focal analogies seem to be almost ubiquitous. Some basic logical or practical problems, some of which may date back to the dawn of human evolution, seem to have been solved the same way throughout human history, giving rise to focal points common to most human agents, as they make analogy to the same precedent solutions. For example, the very basic problem of how to divide a sum may have risen to the almost ubiquitous principle of equal division (as Hayek 1973 speculates). Other focal analogies have given rise to only a few competing strategies. For example, given the problem "pick a number", primes, or the first number in a sequence, or the only even number, etc. are competing focal points. Like the principle of equal division, these focal points are likely to have evolved in coordination situations long ago.

However, focal points like even numbers are not universal. Some basic coordination problems have been solved differently in different groups of agents. Sometimes, a relatively small group of agents solve a particular coordination problem that is relevant for them only, and may re-use their solution strategy later for coordination purposes by analogy. Consequently, this type of focal points is much more specific and with more limited applicability. We shall argue that a cluster constitutes a good example of such situations with narrowly defined coordination problems and specific focal points as solutions, because it comprises a limited and often fairly stable number of agents, facing a limited range of specialized and related tasks.

⁶ There is evidence from experimental game theory for this. In this body of literature analogy is discussed under the heading of precedent formation and utilization in repeated games, that is, how past equilibrium experiences may transfer across games (e.g. Knez 1998).

In an interaction situation, an agent is placed in a strategic situation and is therefore concerned about what the other agents will do. In some cases he will try to figure out what analogies other agents may resort to. Thus, there is a higher-level coordination problem of choosing the same analogy (cf. Sugden 1989: 94). What, then, determines which analogy is chosen? And how can we explain that in a cluster, the same analogies are chosen by all (or most) local agents, resulting in dominating focal points that may be very different from those of agents outside the cluster? Our central propositions concerning this problem is that making analogies has both cognitive and information *costs*, and that single agents in a cluster balance these with the *benefits* of strategies in determining the focal points that will win out, and that this balancing takes place through social learning within the cluster.

Cognitive costs of analogy making

First, we suggest that the focal points that evolve within clusters are limited by the cognitive costs of making analogies. Cognitive costs are the resource costs of not being able to efficiently *process* (digest, store, retrieve, synthesize, memorize....) information.⁷ It is different from search costs, which are the resource costs of *acquiring* certain pieces of information. Even if a range of information is available to a given agent, he will make sense of only a subcategory of this, depending upon what he “scans” for and depending upon his prior knowledge. How much he benefits from the information that he has obtained further depends upon his capacity to process it (i.e. to combine it with his previously obtained information and preexisting knowledge). In short, even with an abundance of information, little is obtained, and even less leads to learning, if it is very different from the information and knowledge we already possess.⁸ There is quite some ambiguity in the literature concerning what cognitive structures consist of — mental capacities, language skills, etc. — and whether they can be different between agents, can change over time, and so on.

However, some cognitive structures are most likely dependent upon the physiology of the human brain (Hayek 1952) and equally apply to everybody. In other words, some cognitive costs are ubiquitous. Concerning analogy making in a cluster, the similarities and differences (i.e., the degree of isomorphism) between earlier situations and the present determine the size of

⁷ For pertinent work on cognitive learning in economics, see Brenner (1999). One effect of cognitive costs, as we have defined them, is cognitive dissonance (see Festinger 1957).

⁸ Cohen and Levinthal (1990) suggest that organizations also have “absorptive capacities”— internal structures that determine what they can do with the information that they have access to.

the cognitive costs of making an analogy. This argument is inspired by Weitzenfeld's (1984) enlightening discussion of reasoning by analogy. While aimed at understanding the limits of the use of reasoning by analogy in scientific discourse, there is no reason why its insights should not be transferable (by analogy!) to players engaged in more mundane interaction. Weitzenfeld makes a distinction between "*homeomorphs*" (i.e., analogues of the same kind) and "*paramorphs*" (i.e., analogues of different kinds). He points out that valid reasoning by analogy requires that "... [f]or an inference from some known properties of a particular to other properties, there must be some determining relations between the properties. That is, the properties must be values of variables bound by a non-accidental relation. This set of non-accidental relations I call the determining structure of the particular" (Weitzenfeld 1984 p. 142-3). It is isomorphism of determining structures that validates the use of analogy. Thus, we may suggest that when agents in clusters make analogies across interaction situations, players rely on reasoning which involve comparisons of determining structures, for example, comparisons between what they believe are the forms of the relevant situations. Because it incurs fewer cognitive costs to make an analogy between homeomorphs than between paramorphs, the former may be a more prominent source of focal points than the latter.

Information costs of analogy making

It is likely that strategies resting upon paramorph analogies can only become focal points if they are circumscribed with advantages that offset their relatively higher cognitive costs. We propose that such advantages may be low *information costs*. If it is particularly easy to obtain the information needed to apply a strategy — for example, through information services or through gossip within a cluster —, it may be repeatedly chosen by agents, even if the analogy making associated with it is relatively taxing. Whereas cognitive costs are determined by the abilities of the agents who make an analogy, information costs are determined by the nature of the cluster as a whole — in particular, how agents are connected in social networks that enable them to obtain information.

In conclusion, this section has suggested that when focal points are formed, it happens through experimentation and imitation, and that agents are likely to experiment with those strategies that incur the lowest cognitive and information costs first. Agents can experiment with applying a strategy that has been applied in earlier situations — if such situations were similar to the present, the analogy is easily made. If the re-application of this strategy proves efficient, it is consistently applied. If not, for example because it proves costly in terms of money, time, or information, agents may experiment

with analogies which incurs higher cognitive costs, but may also yield higher pay-offs.

VI. An Empirical Example⁹

As a way of illustrating the propositions put forward above, we now turn to an empirical example. By means of the notions of cognitive coordination, focal points, and analogy making, we shall try to explain the growth of one of the successful furniture producing and exporting clusters of the world: The Danish Salling industrial district. It should be noted that what follows is in no way an empirical *test* of the validity of our propositions. Such a test is beyond the scope of this paper. However, withstanding the limitations of the case study method, the practical application of our propositions to the Salling case has indeed proved useful, and hence lends them some merit.

Coordination tasks in the furniture industry

The European furniture industry mainly consists of SMEs, due both to production technology and the predominance of traditional management styles. Recent globalization of competition has led to only modest restructuring and consolidation of the industry. Because of the volatility of consumer markets and growing demands for product varieties and innovations, there is an increasing pressure on furniture producers to specialize and outsource further (Maskell et al 1998; Lorenzen 1998; 1999). Most networks of specialized firms consist of independent firms, and there seems to be little scope for joint ownership or other types of formalized governance. This form of industrial organization implies particular tasks of coordination.

First, there is a category of tasks related to *bargaining*. The diversity of customer demands necessitates many specialized furniture producers to shifting between particular suppliers, while maintaining a core of dedicated suppliers. After firms have obtained information on which suppliers have the right qualifications and capacity at the appropriate time, and judged with whom to enter into relations, they still face the task of agreeing with their supplier upon price and quality levels. Second, there is a category of tasks related to *governance*. In order to cooperate, managers need to align expectations with respect to a host of variables, many of which are not (perhaps cannot) described in contracts. However, furniture production systems consist of specialized independent manufacturers. In such systems, there may be larger scope for opportunism and malfeasance between buyers and suppliers than if all the production units were under the same ownership.

⁹ This section builds on Foss and Lorenzen (forthcoming 2002).

Unfortunately, within the furniture industry, contract writing is often inhibited by high costs (both in terms of transaction costs and loss of the flexibility and speed of delivery, which is so important on furniture markets)(Lorenzen 1998; 1999).

Coordination problems and solutions in the furniture industry

There is a host of incentive-related and cognitive aspects to these bargaining and governance tasks. Concerning bargaining, the solution may be to rely upon standards. However, great incentive conflicts between firms (and other stakeholders in the industry) may surface when a standard is to be set. In our terminology, there is a potential incentive-related coordination problem here, which may be found within the furniture industry. In the furniture industry, many local standards also evolve organically rather than being set by a central body. However, how standards evolve is not a trivial problem. A manager may face a problem of choosing the same standard as his potential partner.

Concerning governance, what drives down its costs in some of the most successful furniture producing regions of Europe (notably, the Italian or Danish industrial districts), is only rarely incentive alignment through contractual means (or if too costly, through ownership). Rather, it would be more correct to say that managers' *expectations* are aligned through common focal points like social conventions. *In turn*, this cognitive coordination allows for the smooth operation of reputational effects and contracting which also characterize these regions. In other words, the governance mode of furniture managers within many successful regions is social trust. Arguably, in the furniture industry, incentive alignment through contractual arrangements and reputational effects as a means to lowering transaction costs cannot take place without some level of social trust — because we cannot expect managers to commit themselves to sinking costs into their cooperative arrangements without some initial (aligned) expectations that they will not waste their investments (Lorenzen 1999).

Regional competitiveness of the Danish Salling district

Maskell et al. (1998) and Lorenzen (1998; 1999) argue that institutional endowments of regions determine their specialization and export success with regards to furniture manufacturing. Conversely, Kautonen (1998) has explained the decline of furniture production in the Finnish Lathi region by means of its low level of social trust, and Kjær (1998) makes a similar argument concerning the Swedish furniture industry. Arguably, what determines success within the furniture industry is the ability of managers to solve coordination tasks, and predominantly those related to cognition.

In the following, we shall outline the case of the Danish Salling furniture district. Located around the Salling peninsular and Skive town in West

Jutland, the district encompasses a profound and growing agglomeration of specialized economic activity in Danish terms.¹⁰ Here, flexibly specialized small and medium-sized furniture firms dominate, reaping external scope, scale, and learning economies. Managers of furniture producers efficiently solve bargaining and governance tasks related to maintaining cooperative relations, and we shall exemplify how this is done on the basis of efficient cognitive coordination. We will also account for how cognitive coordination has evolved within the district.

The data presented was obtained in the period 1993-1998, through 27 semi-structured interviews in firms and other local organizations (such as the local producers' guild; the technical school; the union; a bank; a credit association; and the local industrial development agency). The mechanisms underlying the coordination patterns demonstrated through these interviews were then investigated through in-depth studies of three selected firms.¹¹

Bargaining by analogy in the Salling district

A first example concerns Salling managers' solutions to *bargaining* problems. The tasks of aligning their interdependencies and designing flexible

¹⁰ In 1996, the seven municipalities of the Salling district comprised more than 54 furniture producers and at least 2388 employees within this industry. Furniture production made up 33% of manufacture, and 28% of manufacturing employment. The export rate of the firms within the Salling district is higher than the high Danish average of 80%, and success stories have been frequent of Salling firms exploring new markets, branding products, and developing new designs. That the Salling district has in this way taken the lead when it comes to Danish furniture exports has not only meant growth of some existing producers — it has also encompassed numerous start-ups of new small firms. Today, in spite of some firms that have grown to a considerable size, the average size of Salling furniture firms is still small. The small size of most firms seems not to hinder their economic development — based on their organizing still new networks aiming at subcontracting, exports, brands, or designs. Thus, apart from a few large firms, the growth of furniture production in the Salling district is accounted for by a particular group of firms (roughly, two thirds of the total number of local firms), with a large ability to cooperate. This section shall focus upon this core group (“Salling” will from now on refer to members of this group).

¹¹ The in-depth studies consisted of repeated semi-structured interviews, where findings were also validated, plus performing on-site observations of the activities of the manager-owners of the firms during the same week in the fall of 1997 (*time studies*). This method for the in-depth studies allowed combining accounts for time expenditures, routines, external contacts, and information exchanges within the studied firms and between them and their partner firms with qualitative data on issues such as trust, communication, and cognition.

cooperation practices are solved through relying upon non-formalized and oral *standards* for prices, delivery quality, and delivery times.

Where do the focal points encapsulated in these standards come from? Price and quality levels are set as a part of negotiating processes between single suppliers and buyers. Because producers spread information in order to make their suppliers perform better, and suppliers often share price and quality information, collective standards quickly arise, as all suppliers have to make an effort to perform so well that their customers do not switch to other suppliers for price or quality reasons. Standards are regularly adjusted, and hence, cannot be considered as very stable focal points in themselves. However, the principle of *utilizing* standards is quite stable. Even if bargaining problems vary — since, for example, prices need adjustments more often than qualities — managers label and solve most bargaining situations the same way, making analogy to how earlier situations were solved.

Why is this analogy made, and why has the strategy of utilizing standards become a dominating principle? Clearly, utilizing the standards is an efficient and inexpensive means of solving a coordination task, and because managers exchange information and advice to a very high degree, they have taught each other to use them. Furthermore, as more and more suppliers are forced to comply to standards, and as more and more buyers rely on standards, the value as a focal point of this strategy continues to increase.

The twin cognitive problems of arriving at appropriate standards, plus choosing to *use* standards at all, are thus solved by social learning processes, circumscribed by the economic efficiency of using standards; the low information costs (ease of access) of standards; and social pressure towards complying to standards.

Governance by analogy in the Salling district

Even more illustrative for our purpose is to observe how Salling managers' carry out the coordination tasks of *governance*. Roughly speaking, they find themselves in four different categories of interaction situations:

- Downstream situations with agents or retailers (only faced by end producers).
- Upstream situations with non-specialized suppliers.
- Upstream situations with specialized suppliers.
- Horizontal situations.

In the first two categories of interaction situations, producers govern through contracts, as both retail chains and non-specialized suppliers demand this. However, the two next categories of interaction situations are excellent examples of cognitive coordination. Interviewed Salling managers claim that they are not very keen on the formalities necessitated by writing contracts

with agents, retailers, and non-specialized suppliers (mostly, none of these are not from the Salling district). In essence, in the vertical and horizontal interaction situations with local specialized suppliers, they rely on ascriptive trust rather than contracts. The typical Salling managers expect each other to refrain from opportunism, even when no types of non-contractual safeguards (such as credible commitments) are present.

Where does the basis for ascribing trust come from? The typical criteria for ascribing trust to another manager is that he follows a particular set of common local social norms (in essence, he should be a manager-owner, a quality-conscious rather than price-focused craftsman, and a local patriot) — plus, importantly, that he is a local. In particular, the local producers' guild constitutes an efficient social group, where reputational effects prevent opportunism and reinforces social trust. The efficiency of the strategy of ascribing trust, the low costs of the information needed for ascribing trust according to the above criteria (i.e., gossip), plus the social learning effects within the producers' guild are the reasons that this strategy has become so dominant. In fact, managers use this strategy in both vertical and horizontal interactions, even if they are very different in terms of products, standards, and so on. In spite of these differences, Salling managers label vertical and horizontal interactions between locals the same way, and re-apply strategies to new situations, i.e. expect each other to base each new deal on ascriptive trust, and to use the above criteria for trustworthiness. Most of the vertical (supplier) relationships in Salling are of much older date than horizontal networks. Thus, in the latter, analogy is made to the former in order to arrive at a governance strategy.

Why is this analogy made, and why has the strategy of relying upon ascriptive trust become a dominating principle? Interviews suggest that the governance strategy which is predominant in economic networks amongst the Salling managers has in fact emerged through analogy to informal interaction situations that have for long taken place in *social* networks amongst the managers. Ascribing trust on the account of the common social norms has for more than a decade been a strategy applied when meeting and making activities in the producers' guild. In this forum, the strategy predates most of the economic networks between local firms. Up to the 1980s, there were few economic networks between Salling firms, and they were based on painstaking and slow trust-building processes and placement of credible commitments. With the expansion of the German market in the 1980s, the boom in the number of Danish furniture producers, and a larger technological scope for (and market pull towards) specialization and outsourcing, Salling managers increasingly began to “demand” trust. As a quicker means of achieving it, they begun to rely on third-party advice, as colleagues within the producers' guild shared their positive experiences with other trustworthy

members of the producers' guild. A particular group of managers among whom recommendations were frequent and reputational effects high emerged as a consequence. Most of the managers within this group have now, in need for a means of quickly and cheaply finding and trusting new partners for (short or long term) cooperative arrangements, developed a routine of searching for the partner within their own ranks, and trusting this partner, unless the trust placed in him is abused (which it, in part due to reputational effects, usually is not). Through social learning, step-by-step trust-building processes taking place in each individual network have become superseded by a common (social) ascriptive trust. The market efficiency of ascriptive trust (it allows firms to quickly, inexpensively, and flexibly coordinate and thus specialize and cooperate) means that more and more local producers are willing to experiment with it. Its value as a focal point hence increases in a self-reinforcing learning process.

VII. Concluding remarks

The discussion in this paper is highly speculative and roams widely. The central proposition is that cognitive coordination plays a pivotal role for trust-based cooperation and communication amongst entrepreneurs in a regional cluster. By arguing that agents to a very large extent may rely on analogy to earlier interaction situations in coordinating their actions, and that dense social networks facilitated by geographical proximity within a cluster function as a frame for analogy making, we have proposed an explanation for how and why cognitive coordination may be particularly efficient within regional clusters. We proposed that analogies that come up with solutions that are inefficient in the long or short term are most likely to be discarded. Further, cognitive costs rising from lack of ideomorphism between two interaction situations might impede analogy making. The success of coordination through analogy depends on the extent to which the relevant analogies are homomorphs or paramorphs. The more in the direction of paramorphs, the harder it will be for players to coordinate their analogies, and therefore their actions. Finally, we suggested that social learning is central for how interaction situations may "feed" into each other.

We applied our propositions about cognitive coordination and analogy making to the case of the Salling district and argued that our perspective could cast considerable light over the organization and development of this cluster. This theoretical approach to our case study meant that we were able to account empirically for one of its central features: The non-planned, decentralized coordination taking place between independent business units. In comparison, many existing empirical studies of industrial clusters limit

themselves to listing some of the symptoms of such coordination, for example, a range of local public and private institutions and associations. Our approach gave theoretical and empirical substance to phenomena like *trust* and *social capital* within the case cluster. We demonstrated how Salling managers who solve both problems of price bargaining and of quality bargaining by referring to collective standards, make homeomorph analogies. Because the price and quality bargaining situations have same variables (managers), relations between variables (subcontracting arrangements), and determining structure (e.g. risks and pay-offs), the analogy is cognitively inexpensive to make. The case however also gave evidence of linkage of dissimilar situations, namely managers that use a strategy for finding and trusting a partner by a paramorph analogy to how social life is conducted within the local producers' guild. This analogy is considerably more cognitively taxing. That a strategy resting upon a paramorph analogy — thus implying higher *cognitive* costs — could become a focal point solving governance problems amongst Salling managers can be explained by the high *market* efficiency of the strategy itself. Ascriptive trust facilitates flexible specialization and has helped Salling furniture firms in gaining considerable export shares. Furthermore, the strategy is supported by extremely low *information costs*, as the information needed in order to ascribe trust is readily available to the managers as gossip in the local producers' guild. This observation on low information costs also applies to the strategy of relying on price and quality standards: It is easy for local suppliers to achieve information about the prices and qualities of other local suppliers as this is shared between managers.

We suggested that with time, cognitive coordination might become more efficient within a regional cluster, because focal points become more widely disseminated through social learning, and the emergence of new networks. As cognitive coordination in turn facilitates network building, the process of cognitive coordination may become self-reinforcing. That history matters so much for clusters may explain why it is so extremely difficult to imitate the functions of a cluster elsewhere, or to create one by design. However, the path dependence of clusters and the cumulative causation that may take place can also lead to lock-in and inefficiency. If world markets shift, or the structure of a cluster in other respects becomes inefficient, the dominance of particular focal points and hence particular ways of doing things can be a regional liability instead of an asset, as it prevents change. While strong focal points may facilitate technological innovation through facilitating firm interactions, they may prevent larger scale changes. The paper has not sought to deal with this question, nor the questions of why and how lock-in situations have been avoided by some clusters and not by others.

The paper has only represented a first stab at accounting for coordination within clusters. Clearly, there is room for more substantial theoretical work here, as well for empirical testing. The Salling case was applied for the sake of illustration rather than testing. The case illustrated that cognitive coordination may indeed be a central feature of a cluster, and that the development of such cognitive coordination may be a long and complex process. The case also exemplified how geographical proximity and information costs are interrelated. There seems to be a rich potential for further empirical as well as theoretical research into the interrelations between these two phenomena.

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