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# Cognitive Coordination and Economic Organization: Analogy and the Emergence of Focal Points

**Nicolai Foss and Mark Lorenzen**

Department of Industrial Economics and Strategy

Copenhagen Business School

Nansensgade 19,6;

DK-1366 Copenhagen K

Denmark

njf.ivs@cbs.dk, mark@cbs.dk

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## Introduction

The theme of this paper is the cognitive dimension of institutions (Scott 1995). By this we refer to how institutions provide the schemas, scripts, points of orientation, signposts, etc. that allow agents to coordinate their actions by first coordinating their beliefs, (expectations, plans, strategies, etc.) (Hayek 1937, Lachmann 1971; Foss 1996) — what we call "cognitive coordination." The main aim is to take steps towards an understanding of how cognitive coordination may enter into the theory of economic organization. This is a huge cherry cake, because a range of diverse disciplines and fields are involved in the inquiry and because the basic issues are so very many. Moreover, the very notion of "cognitive coordination," as well as its implications and ramifications, are extremely underdeveloped. Only recent contributions to game theory offer *rigorous* treatments of cognitive coordination (e.g., Crawford and Haller 1990; Geanakoplos 1992; Shin and Williamson 1996; Colman 1997). And only recent contributions to organizational sociology offer, as far we know, good *illustrations* of cognitive coordination (Smelser and Swedberg 1994; Scott 1999). In this paper, we draw on both of these approaches. However, given the limited space available here and the preliminary state of the discussion, our argument is unavoidably sketchy. The argument is roughly the following.

The basic problem in all of economics is that of *coordination*. In the conventional understanding, coordination in a group of agents concerns maximizing the joint-surplus of their productive activities.<sup>1</sup> Coordination *problems* exist to the extent that there are impediments to reaching such a state. Impediments to coordination imply that the first-best (i.e., the best imaginable

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<sup>1</sup> Under the usual assumptions about quasi-linear preferences, etc. See Milgrom and Roberts (1990).

allocation) cannot be reached. Such impediments may take many forms. They include moral hazard (Holmström 1982), the hold-up problem (Hart 1995), opportunity costs of time spent on bargaining (Rubinstein 1982), costs of monitoring and enforcing an agreement, delay costs, and the costs of not reaching an agreement when efficiency requires cooperation (Milgrom and Roberts 1990). Numerous able contributors have erected an impressive edifice on these foundations under the rubrics of “contract theory,” “mechanism design,” and “new institutional economics.”

We have nothing to add to these literatures, nor is it our intention to criticize their specific conclusions and approaches. Rather, we are concerned that economists of organization may have devoted disproportionate attention to some kinds of impediments to coordination at the expense of others that arguably are deeper ones (see also Langlois and Foss 1999). To put it less mysteriously, virtually all of the economics of organization assumes that interaction situations are characterized by heterogeneous (or, “asymmetric”) information but homogeneous beliefs — and that agents know this. We may say that such situations are “*cognitively well-defined*” (for the agents and the analyst). For example, agents, strategies and rationality are routinely assumed to be common knowledge. It is completely understandable why such assumptions are made: They enormously ease analysis. However, there is much point in also analytically addressing situations that are *not* cognitively well-defined — as when agents have, at least initially, ill-founded, contradictory and incomplete beliefs about other agents, strategies and rationality — and to ascertain how evolved institutions may remedy the attendant coordination problems. Arguably, the cognitive coordination problems caused by differing beliefs are more fundamental than the coordination problems related to incentive conflicts, because they need to be solved before the latter category of coordination problems can be addressed.

Thus, understanding how situations *become* cognitively well-defined — that is, the process of achieving cognitive coordination — should be a central analytical task for economists.

From an analytical point of view, the basic problem is that it is very hard to say anything definite about cognitively ill-defined interaction situations. Nevertheless, in the following we shall briefly discuss what it means for an interaction situation to be cognitively ill-defined, and we shall also speculate on how an interaction situation becomes better defined. We propose that agents can overcome cognitive coordination problems through the use of, for example, precedents that may eventually become institutionalized, and through the associated analogical reasoning. Thus, we are taken up with how agents may evolve various shared cognitive categories that assist them in coordinating their actions.

Section II discusses the notion of cognitive coordination in basic game theoretic terms as well as the derived notion of cognitive coordination problems. Section III then turns to *solutions* to cognitive coordination problems. Here, common experience, in terms of focal points, is taken to solve cognitive coordination problems. Section IV addresses the problem of the cognitive coordination process — in other words, which focal points may arise — through discussing the role and costs of *analogous reasoning*. In order to come up with some propositions on how cognitively well-defined situations are achieved with the aid of analogy, section V presents an empirical case — a qualitative account for analogy-making and coordination between managers in a Danish industrial district.

## II. Cognitive Coordination — Meaning

In this section, we briefly and informally discuss the notion of cognitive coordination. We draw on game theory, because we consider this a natural body of thought in which to frame the issue. This is because game theory is at its very core taken up with interactive beliefs in the form of strategic behavior, and with analyzing states where cognitive coordination obtains.

### **Aligned Beliefs in Game Theory**

It has often been observed that mainstream economics and most of game theory assume cognitive homogeneity, that is, people are assumed to classify and process information in much the same, and typically correct, way (Denzau and North 1994). Thus, they hold the same (correct) beliefs (Hayek 1937; Young 1998). Homogeneous and correct beliefs represent a first understanding of cognitive coordination. This is because these qualities of beliefs are associated with equilibrium states.<sup>2</sup> However, it is possible to be more explicit about the notion of cognitive coordination. Game theory contains a number of concepts that are useful here. One such concept is common knowledge (i.e., “A knows that B knows that A knows ... that X”). Another example is the Harsanyi doctrine, which roughly says that rational individuals who hold the same information must independently come to the same conclusion, and that, therefore, no rational person can expect to be surprised by another rational person (who holds the same information). In modern game theory parlance, “consistent alignment of beliefs” obtains. Although this is different from common knowledge, it is clearly not so far from it. For example, if I know that you know that ... etc. I expect it to rain tomorrow with probability  $\frac{3}{4}$  I know that you know that ... etc. you expect it to

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<sup>2</sup> For example, in rational expectations equilibrium.

rain tomorrow with probability  $\frac{1}{4}$ , we may infer that we have access to different information sets, and this in itself should change probability estimates so that, in the limit, we will end up holding the same probabilities. In others words, rational agents cannot “agree to disagree” (Aumann 1976). Taken together, common knowledge and consistently aligned beliefs represent precise notions of cognitive coordination.

Albeit extreme, the assumptions of common knowledge and consistently aligned beliefs are often helpful, for example, in connection with the analysis of bargaining games or repeated games in general. They are particularly useful for making coordination problems well structured. They guarantee the analyst that he does not have to worry about what the players believe about a host of other variables that might influence the problem, because the players believe about these is correct and they hold the same correct beliefs. For example, the analysis of incentive compatibility constraints is certainly made much simpler by this. Thus, the assumption keeps things manageable, allowing the analyst to proceed in a piecemeal fashion.

However, for some interaction situations, hyper-rationality alone does not guarantee coordination (on the Pareto efficient equilibrium) (e.g., Sugden 1989, 1995; Crawford and Haller 1990; Colman 1997). This sort of argument has mainly been exercised in the context of shared interest (“pure”) coordination games, such as symmetric coordination games, asymmetric coordination games or assurance games (Foss 2001). A shared characteristic of such games is that there are multiple equilibria. Even taking the usual refinement procedures into account and assuming common knowledge and consistently aligned beliefs, classical game theory may have problems predicting which equilibrium will be played. This is most obviously seen in the case of symmetric coordination games, where equilibria cannot be Pareto-ranked.

### **Cognitively Ill-Defined Interaction Situations**

For many purposes the assumption of consistently aligned beliefs is also utterly unrealistic.<sup>3</sup> Thus, any student of international business is likely to agree (!) that there is such things as cognitive differences that may persist in spite of people holding the “same” information (whatever that exactly means). One is reminded of the, possibly apochryphical, story about the Japanese supplier firm, committed to total quality, zero defects management, that unable to make sense of a requirement from its American buyer of 95 % defect free deliveries sent a separately boxed batch of 5 % deliberately broken parts and a note saying “We don’t know why you want these.” Of course, it may be objected that the beliefs of the Japanese and the American players will somehow be adjusted. But that is precisely the point: The Aumann theorem in game theory that agents cannot “agree to disagree” should be seen as an outcome of a *process* of adjustment of beliefs. However, it is usually taken as a starting point for the analysis. By starting from situations that are cognitively well-defined — in the sense that common knowledge and consistently aligned beliefs obtain — many theorists have defined away a host of interesting interaction situations.<sup>4</sup> By turning away from cognitively ill-defined interaction situations, theorists sidestep cognitive coordination problems, and, we argue, thereby lose sight of one of the main functions of institutions: To stabilize and align beliefs. However, a number of theorists do in fact devote attention to the coordination problems caused by cognitively ill-defined; we turn to this next.

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<sup>3</sup> Many game theorists are not too happy about the idea of consistently aligned beliefs, either. See, for example, Kreps (1990).

<sup>4</sup> It is easy to gain the impression that classical game theory solves the coordination problem by defining it away, that is to say, by assuming that agents by means of pure ratiocination can reason their way to equilibrium. The exception to this rationalistic approach is, of course, constituted by evolutionary game theory.

### III. Cognitive Coordination — Problems and Solutions

#### **Repeated Games**

Learning in the context of repeated games has lately become a growth industry in the game theory community (e.g., Crawford and Haller 1990; Young 1998). It is notable that much of this literature is motivated by dissatisfaction with the obviously unrealistic assumption that games are cognitively well structured. Thus, the literature highlights dynamics of adaptation in large populations of players that are boundedly rational. More specifically, learning rules and ways of acquiring information are postulated, and this is embedded in a social context. In some cases, learning dynamics lead to a number of classical solution concepts describing the outcomes of interaction between boundedly rational players. Thus, this literature predicts that boundedly rational people can actually cope with coordination problems caused by initially incompatible beliefs. It directs attention to simple rules of thumb, derived from everyday experience, as means of aligning beliefs and hence strategies.

#### **Focal Points**

Beginning with Schelling (1960) and Lewis (1969), another, typically more philosophical, literature has pointed out that classical game theory may assume both too much and too little about the cognitive capacities of players (Bacharach 1993 and Sugden 1995 are outstanding contributions here). It assumes too much in ascribing to players the ability to solve telephone-directory length Lagrangians; it assumes too little when it requires that "... rational individuals should ignore as irrelevant the information that comes to them because they are human beings with common experiences — the very information they need to use in order to coordinate their behavior" (Sugden 1986: 90). Of course, the usual way to capture such "common experiences" is to put them under the label of focal points

(Schelling 1960), and then to treat this as something outside the formal analysis. The reason for this is that game theory usually excludes all information about how players themselves describe — or “label” — their strategies. But it is this labeling that allows much real-world coordination to take place. Of course, the “labels” of this literature, the “distinctions” of Crawford and Haller (1990), and the “conventions” of evolutionary game theory are all made out of the same stuff, namely shared cognitive categories.

Common experience shows that ordinary people are perfectly capable of coordinating their actions in a host of situations even though they may not possess common knowledge and consistently aligned beliefs. Evolutionary game theory, the learning in games literature, and the literature on Schelling points give theoretical substance to this. But these literatures leave many questions unanswered. For example, if a convention institution, such as “Always play strategy One,” may begin to emerge as soon as some players for whatever reason believe that other players will play strategy One, the question is what gives to those beliefs. Relatedly, the notion of focal point is usually invoked as a sort of *deus ex machina*. Where do focal points come from and how do they arise? We discuss this next.

## IV. Cognitive Coordination — Processes

### **Analogy as a Source of Focal Points**

We argue that a source of focal points is can be found in agents’ recall of earlier interaction situations. A focal point arises when agents begin to make *analogy* to the same earlier interaction situation. 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 (Knez 1998).<sup>5</sup>

We may distinguish three categories of situations that give rise to subsequent focal analogies. A first category consists of situations where basic logical or practical problems, some of which may date back to the dawn of human evolution, need to be solved. Some such problems seems 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 ubiquitous principle of equal division may be a strategy that dates back to a very basic problem of division of sums (as Hayek 1973 speculates). A second category consists of situations that have given rise to 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 likely to be focal points evolved in coordination situations long ago. But focal points like even numbers are not universal. Some basic coordination situations have been solved by different strategies in different groups of agents. The third category comprises the much more narrowly defined situations where a relatively small group of agents develop a strategy, which may later be used for coordination purposes by analogy. The focal points are much more specific and with more limited applicability. For example, once developed, a principle for sharing social tasks amongst employees in a small Danish garage may help in preventing conflicts, but may be impossible to apply with success in an Italian monastery, where the employees have different

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<sup>5</sup> For example, in a much quoted study, Van Huyck, Battalio, and Beil (1991) examined a repeated average opinion game, in which players were asked to pick a single number on the set of integers [1,7], and in which individual pay-offs increase in their proximity to the median number picked by all the players. Of course, in equilibrium all players select the same number. Van Huyck et al (1991) now found that the median action selected in the first round of play completely determined play in all later rounds. Hence, although 7 different equilibria are possible, players stuck to exactly the same equilibrium throughout. Thus, players seem to fall back on simple "keep rules that have worked well" heuristics when confronted with the complexity posed by potential coordination failure.

personal preferences, work tasks, and family commitments.

### **The Choice of Analogy**

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 many cases, the same analogies are chosen by all (or most) agents within a particular groups of agents, resulting in dominating focal points that may be very different from those of other groups of agents? The problem is that a priori reasoning is not likely to carry us very far here.

## **V. An Empirical Case<sup>6</sup>**

In order to both illustrate the role of analogical reasoning, as well as to take steps towards tentative generalizations, we have chosen to turn to the somewhat unusual strategy of combining game theoretical ideas with a qualitative case study, so as to let the latter inform the former. The empirical case presents examples of cognitive coordination in the Danish furniture industry, illustrating the role of analogies for economic organization, as well as providing an account for how analogies are chosen here. It thus provides inspiration for coming to better terms with the question of coordination processes. The following case draws examples from a low-tech industry constituting a particularly interesting example of coordination: The furniture industry. More specifically, the case goes some way towards illustrating how coordination problems are solved within one of the

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<sup>6</sup> The data in is section is taken from Lorenzen (1998; 1999).

successful furniture producing and exporting districts of the world: The Danish Salling district.

### **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. 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. 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).

### **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, the related coordination problems have been given much attention within the organizational economics literature. For example, Williamson (e.g. 1975, 1993) — along with most other writers in the field of organizational economics — argues that the potential coordination problems related to governance are predominantly related to poorly aligned incentives, and that such incentives may in turn be aligned through contractual means, or if too costly, through ownership. However, because transaction costs economics largely ignores the cognitive aspect of governance (Langlois and Foss 1999), it has problems accounting for how transaction costs are lowered within industries like the furniture industry. In some of the most successful furniture producing regions of Europe (notably, the Italian or Danish industrial districts), what drives down governance costs on the market is perhaps not so much incentive alignment per se. 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.

When such whole groups of agents — some of whom may never have met — have aligned their expectations on the basis of some common cognitive institutions, *social trust* may develop.<sup>7</sup> The type of cognitive coordination inherent in social trust rests upon a mechanism of managers *ascribing* trustworthiness to other managers of a particular type (like when a patient trusts a doctor, not because he knows him as a person, but because he ascribes trustworthiness to doctors in general). Hence, ascriptive trust essentially rests upon analogy making: Agents expect the behavior of other agents belonging to a particular social group to be similar to other members of that group, and these expectations are shared among agents. When this is the case, cognitive institutions, in the sense of generally shared expectations with respect to the behavior of certain types of agents, exist.

Arguably, in the furniture industry, incentive alignment through contactual 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 1998).

### **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

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<sup>7</sup> Social trust is thus different from *inter-personal trust* — where two or more agents meet and gradually build trust on the basis of their personal experience and/or investments (what Williamson (1993) calls *credible commitments*).

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.<sup>8</sup> Here, flexibly specialized small and medium-sized (SME) 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

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<sup>8</sup> 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).

investigated through in-depth studies of three selected firms.<sup>9</sup>

### **Bargaining by Analogy in the Salling District**

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

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<sup>9</sup> 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.

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, they are manager-owners, quality-conscious rather than price-focused craftsmen, and are local patriots) — 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 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 began 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.

## VI. Cognitive Coordination: Some Tentative Propositions

Spurred by the empirical case, we now put forward some propositions about the processes of cognitive coordination. More specifically, we propose answers to the questions of how and why particular analogies are made, and how and why

particular strategies come to dominate as a solution to cognitive coordination problems. In other words, we go into some detail with respect to identifying the determinants of cognitive impediments to coordination. Our central proposition is that making analogies has both cognitive and information *costs*, and that they are balanced with the *benefits* of strategies in determining the focal points that will win out, and that this balancing takes place through *learning*.

### **Proposition I: Cognitive Costs Influence Analogy Making**

First, we suggest that *there are cognitive costs of analogy making*. Cognitive costs are fundamental to humans, and are determined not by external factors — such as the cost of the information available to us —, but of the cognitive structures that we possess *ex ante* to any cognitive process. Cognitive costs are the resource costs of not being able to comprehend and therefore efficiently process information. It is different from information costs, which are the resource costs of possessing 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. His incorporation of 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.<sup>10</sup> 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.

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<sup>10</sup> Cohen and Levintahl (1990) suggest that organizations also have “absorptive capacities”— internal structures that determine what they can do with the information that they have access to.

However, striking a Kantian chord, some cognitive structures are most likely dependent the physiology of the human brain (Hayek 1952) and equally apply to everybody. Therefore, some cognitive costs are ubiquitous. Concerning analogy making, the similarities and differences (i.e., the degree of isomorphism) between earlier situations and the present determine the size of 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 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 in the case of making 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 (e.g., with respect to agents, strategies, and pay-offs). 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.<sup>11</sup>

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<sup>11</sup> The Van Huyck et al. (1991) study clearly involved homeomorphs, because the average opinion games that were considered were essentially identical. In contrast, Knez' (1998) study of precedent transfer from 2 players conflict-of-interest games to 3-persons conflict-of-interest games involving a (weak) paramorph, since players and pay-offs were different

The empirical case illustrated homeomorph analogy by Salling managers who solve both problems of price bargaining and of quality bargaining by referring to collective standards. 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 dis-similar 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.

### **Proposition II: Information Costs Influence Analogy Making**

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.

### **Proposition III: Cognitive Coordination is a Learning Process**

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(although the basic game form was the same). Perhaps not surprisingly, Knez' results were also much more ambiguous than those of Van Huyck at al., suggesting the perhaps obvious point that it is less cognitively taxing to make an analogy between homeomorphs than between paramorphs.

While classic game theory simply assumes that in coordination games, agents reason their way to equilibrium, we wish to offer a tentative explanation that accounts for the mechanisms of coordination. Thus, we propose that in cognitive coordination situations, agents can arrive at an efficient balance between minimizing cognitive costs of analogy making, information costs, and maximizing efficiency of strategy through *experimental learning*. 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 incurring slightly higher cognitive costs, but with higher efficiency of the tried strategies.

#### **Proposition IV: Focal Points Become Common Knowledge Through Social Learning**

The empirical case also allows us to suggest an explanation to why a focal point may become institutionalized within a larger population of agents (i.e., a community). In this case, all the agents need not rely on their own personal experience, rather, the learning processes of most of them consist of imitation rather than experimentation: They imitate the observed successful strategies applied by others. Through *social learning*, a common focal point becomes institutionalized, hence allowing the population — the community — of agents to coordinate their expectations (Bandura 1977). In communities where interaction situations are thus cognitively well defined, transaction costs of market-based forms of organization are often low, as illustrated for the Salling district.<sup>12</sup> Social learning processes seem to function with least effort in communities with frequent

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<sup>12</sup> The economic value of low transaction costs in communities with a high degree of cognitive

interactions between agents, for example, geographically proximate communities like industrial districts.

## VI. Conclusion

By arguing that agents to a very large extent may rely on analogy to earlier interaction situations in achieving coordinated states, we have provided some building blocks for a rudimentary theory of the dependence of economic organization on cognitive coordination. Part of the foundation for economic organization in a particular firm, market, industrial district, etc., may be the analogies that are applied in the process of achieving cognitive coordination. We have inquired into the nature and origins of such analogies through speculation in combination with an empirical example. 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.

These suggestions were supported by the empirical case, which also provided some insights into the emergent nature of coordination processes. The case suggested that social learning is central for how interaction situations “feed” into each other. Consequently, we speculated on the scope of such learning processes.

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coordination is coined in the term “social capital” (e.g., Woolcock 1998).

If one accepts our reasoning, it is obvious that most of economic theory has ignored cognitive coordination at its peril. Assumptions of common knowledge and the alignment of beliefs make it hard to understand the nature of cognitive impediments to coordination on the one hand, and how real world people are able to coordinate their beliefs and actions with reasonable success in spite of these impediments. Presumably, the reluctance to relax extreme assumptions is caused by the difficulty of handling cognitively less well-defined interaction situations in formal terms. For this reason, there is very little existing research in the nature of coordination when interaction situations are not cognitively well-defined. Our contribution rests upon an unconventional research methodology of combining theory, speculation, and ideographic insights from a qualitative case study. Because the issues are so complex here, we feel that this type of research is justified. Progress in the understanding of cognitive coordination is only likely to happen as a result of a close interplay between theoretical work — for example, in game theory —, empirical work and experimental work. However, to borrow a phrase, that will be the subject of future work.

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