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Cross-border cooperation: the meaning of cognitive and normative expectations for the emergence of Global research and development cooperation

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TranState Working Papers

CROSS-BORDER COOPERATION
THE MEANING OF COGNITIVE
AND NORMATIVE EXPECTATIONS
FOR THE EMERGENCE OF
GLOBAL RESEARCH AND
DEVELOPMENT COOPERATION

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No. 49

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Staatlichkeit im Wandel • Transformations of the State
Sonderforschungsbereich 597 • Collaborative Research Center 597

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Cross-Border Cooperation.

The meaning of Cognitive and Normative Expectations for the Emergence of Global Research and Development Cooperation

ABSTRACT

Drawing on Niklas Luhmann's theory of social systems, we analyse the importance of different styles of expectation (cognitive and normative) for global research and development cooperation in two industries: the pharmaceutical industry and the software industry. In our study, we find that contrary to Luhmann's prediction in 1971, the normative expectation style still plays a vital role for the cooperative deals under examination. The second result of our study is that non-state mechanisms such as reputation, resource-dependency and trust are highly important for the stabilization of normative expectations in global business transactions. The role of the state-based legal system is reduced to stabilizing few, albeit crucial, normative expectations.

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I. INTRODUCTION

Until the 1970s, during the “golden age” (Habermas 1998) of the democratic constitutional and interventionist state (DCIS), economic exchange was predominantly conducted within the borders of domestic markets. The state provided economic actors with legal certainty, thus facilitating the emergence of economic cooperation (Coase 1998). Today, in the era of economic globalisation, the amount of exchange transcending the borders of the nation state is significantly higher in comparison to the 1970s. Since the ability of the legal system to facilitate economic exchange is primarily restricted to the territory of the nation state, researchers from various disciplines question whether the state’s private law still provides economic actors with a support structure for economic cooperation, or whether today’s transnational exchange processes are rather based on different non-state structural prerequisites (Berger 1996; Fischer-Lescano & Teubner 2006; Gessner 1996; Gessner & Appelbaum 2001; Teubner 1997; Callies 2002, 2006; Schmidt-Trenz 1990).

This working paper aims at contributing to this debate by describing and analysing the support structures that facilitated the emergence of international research and development cooperation (R&D Cooperation) in the software and the pharmaceutical industries. For the purposes of our research, we draw on Niklas Luhmann’s systems theory, since it offers a large body of tools that are helpful in describing the said support structures.

1. Theoretical Framework

Conceptually, Luhmann’s theory is based on the notion of uncertainty. Luhmann starts with two assumptions. On one hand, he asserts that human beings have a limited capability of information processing (bounded rationality). On the other hand, he contends that human beings are confronted with a world of the utmost complexity. This applies particularly to situations of double contingency in which two or more actors, who are supposed to behave strategically, want to coordinate their actions in order to achieve a common goal. To be able to overcome such situations, individuals depend on the existence of so-called “expectation structures” (Luhmann 1983). Expectation structures serve as programmes that help actors to define the means and ends of their action in a rational manner. Thus, expectation structures reduce the uncertainty inherent in social interaction and facilitate the emergence of cooperative action (Luhmann 1968, 1983, 1984; Schimank 1992).

What we have said above with regard to all kinds of social interaction is also applicable to situations of economic cooperation, the subject of this working paper. According to the theoretical assumptions of Niklas Luhmann, it is obvious that the emergence of economic cooperation relies on the existence of effective expectation structures. Without such structures, the future behaviour of a potential cooperation partner would be unpredictable. The actors would feel uncertain and shrink away from the risk of a cooperative venture. Thus, to be able to agree to cooperate, actors depend on the existence of reliable expectation structures to reduce the uncertainty inherent in any cooperative venture (Beckert 1997). As we will show below,

expectation structures which facilitate the emergence of cooperation consist of normative and cognitive expectations.

2. Normative and cognitive expectations

In 1971, Luhmann published an article in which he described the expectation structures of an evolving global society (Luhmann 1971). In this article, he hypothesises that society is changing from a world of territorially organized nation states to a global society consisting of borderless communication systems. In order to illustrate this hypothesis of an emerging world society, Luhmann distinguishes between “normative” and “cognitive” expectations (Luhmann 1971). Normative expectations are defined as expectations that are adhered to in the case of disappointment, while cognitive expectations are those that are either adapted or abandoned when disappointed. Thus, Luhmann differentiates between two possible strategies for dealing with the disappointment of expectations: learning on the one hand (cognitive expectations), and not-learning (normative expectations), on the other (Luhmann 1971).

With the help of this conceptual differentiation between normative and cognitive expectations, Luhmann is able to describe the transformation process from a nationally organized society to a global society. He argues that, in contrast to the nationally organized society of the past, the emerging world society is not governed by normative expectations anymore, but relies primarily on cognitive expectations. Specifically, Luhmann maintains that in the course of the evolution of the global society, the structural primacy enjoyed by the subsystems of politics, law and morals, which consist of normative expectations, is transferred to the subsystems of the economy, science and technology, which consist of cognitive expectations (Luhmann 1971, Fischer-Lescano & Teubner 2006)

This prediction by Niklas Luhmann means that the state’s private law increasingly loses its ability to facilitate the emergence of economic cooperation in global society (Calließ 2006). Following Luhmann, the expectation structures that reduce the uncertainty inherent in transnational cooperative ventures will consist of cognitive rather than normative expectations. Accordingly, actors do not rely on expectations that can be adhered to in the case of a disappointment, but are forced to adapt their expectations to the unforeseen situations that occur in the cooperation process. In the following sections, we will test the hypothesis that the expectation structures that reduce uncertainty in transnational cooperative ventures consist of cognitive rather than normative expectations by analysing the expectation structures of global R&D cooperation in the software and the pharmaceutical industries. We aim at finding out which expectations of a transnational R&D-Cooperation rely on a cognitive and which on a normative style of expectation.

The paper is organised as follows: in a first section, we present an empirical account of the uncertainty which prevails in the cooperative ventures in the pharmaceutical and software industries. We describe how, in the initial phase of cooperation, participants try to form expectations with regard to the situational interests, the competence and the behaviour of their

potential cooperation partners. Uncertainty is reduced through an intensive communication process related to the desired cooperative venture. The second section examines the expectation structure. We identify the main types of expectations that define the expectation structures and we distinguish between their normative and cognitive elements. Next, we describe the different mechanisms that contribute to the stabilization of the expectation structures and that appear as relevant from our exploratory research. Finally, we use case studies to focus our analysis on two central aspects of the cooperative processes in the pharmaceutical and the software industries: the cognitive elements of the expectation structure and the role of the state-based legal system for the stabilization of normative expectations. The results we present in this paper derive from qualitative interviews we conducted with experts from the software and the pharmaceutical industries.

II. UNCERTAINTY IN THE PHARMACEUTICAL AND THE SOFTWARE INDUSTRIES

- Pharma -

The business of pharmaceutical companies consists of developing and selling drugs. The development of drugs starts with the detection of a target structure. Then a chemical substance (drug candidate) that affects the target structure is identified. Next, the drug candidate is tested in different clinical phases to see if it meets all the necessary requirements to actually become a drug that can be sold on the market. In this process of drug development, pharmaceutical and biotechnological companies establish a specific form of cooperation that can be described as follows: The pharma company provides the biotech company with a target structure and commissions it to apply its technology to the target structure in order to identify a drug candidate. After its identification, the drug candidate is returned to the research department of the pharma company where it has to pass various (usually three) clinical phases. The completion of each of the clinical phases involves milestone payments from the pharma company to the biotech company. If the drug is eventually sold on the market, the biotech company usually also receives royalties.

In this cooperation process, the fundamental uncertainty for both companies derives from the fact that, at the outset of the cooperation, it cannot be assured that the specific technology to be used by the biotech company is capable of detecting a chemical substance that actually affects the target structure initially provided by the pharmaceutical company. According to the information we have gathered in our expert interviews, it is very possible that in the course of the cooperation, the biotech company realizes that it cannot accomplish the intended objective by using the proper technology. Even in later stages of a cooperative venture, it is still uncertain whether the drug candidate passes all the different clinical phases and whether it meets all the necessary requirements to become a marketable drug. Statistically, on average, only one out of ten-thousand drug candidates ever become a drug that is released on the market.

The uncertainty described above can be attributed to the fact that at the beginning of the cooperation, the state of knowledge of both companies is too limited to predict exactly how

the process of cooperation will continue in the future. First, the specific technology of the biotechnological company is a highly complex resource. Its ability to detect effective drug candidates cannot completely be assessed by the pharmaceutical company in advance of the cooperation. The suitability of a specific technology does not become evident until it is tested in the course of the cooperative process. Second, even if a biotech company succeeds in developing a promising drug candidate under optimal laboratory conditions, it still remains uncertain in the following research phases whether the drug candidate shows the same results with regard to living organisms and without causing serious adverse reactions.

- Software –

In contrast to the pharma industry, in the software industry it is not fundamentally uncertain whether the objectives of a cooperative venture are scientifically feasible or not. The basic specifications of a desired software product can be defined by the companies in a relatively precise way before the cooperation starts. Furthermore, it is more or less predictable whether the technological competences of each company are suitable to achieve the intended outcome or not. The interviewees mentioned that uncertainty arises only with regard to the precise attributes of a system, such as its speed or its reliability. But according to them, even this aspect of uncertainty could be eliminated by compiling a detailed performance specification. For reasons of efficiency, however, the participants in a cooperative venture often refrain from specifying too many details. Hence, the precise course of the cooperation is deliberately left open.

Implications of the uncertainty

With regard to the pharma industry, our empirical data show that the companies' state of knowledge is too limited at the outset of a cooperative venture to define exactly the desired outcomes of the cooperation process. Therefore, in practice, companies do not know precisely how many resources they will need until the desired product is marketable. The specific work steps of a cooperation process cannot be planned by the companies before the cooperation starts. Consequently, cooperation cannot be fixed exhaustively in a written contract that ex ante provides for all cooperative actions. The same result applies to the software-industry with one important difference: uncertainty prevails here not because of a general impossibility to define all elements in a contract, but because participants are reluctant to do so.

III. THE EMERGENCE OF AN EXPECTATION STRUCTURE

In the following paragraphs we show that companies react to the uncertainty described above by gradually building up a complex expectation structure through a process of “observant communication”. Eventually, this expectation structure is documented and can function as a “guideline” for the cooperation.

Our notion of “observant cooperation” needs further explanation as it is not part of the common economic, legal or sociological vocabulary that pertains to questions of cooperation. Therefore we will proceed with an explanation of our use of this term in our research.

1. Observant communication

Our notion of “observant communication” derives basically from Luhmann’s communication theory (Luhmann 1984). We adopt Luhmann’s central idea that present communication enables an actor to evaluate how another actor may act in the future. Through ongoing communication a structure emerges that reduces the uncertainty with regard to the actions of other actors. Empirically, the term “observant communication” helps us to describe two findings of our research in an abstract way.

First, the term “observant communication” illustrates the fact that companies apply their technological knowledge and their experiences from previous cooperative ventures as an observation pattern to evaluate their counterparts with regard to their situational interests, their competence and their behaviour. In the initial phase of a cooperative venture, companies deliberately discuss certain issues and ask specific questions in order to evaluate the future action of a potential cooperation partner. Second, the term “observant communication” means that in a communicative process companies intensively evaluate possible objectives and adequate means for a cooperative venture. At this stage of the formation of the expectation structure, the companies explicitly differentiate between normative and cognitive expectations both with regard to objectives and to the means of the cooperation. We will show that the differentiation between normative and cognitive expectations plays an important role in enabling the companies to deal with the uncertainty of the cooperation process. The complexity of the expectation structure rises significantly during this later stage.

After this short theoretical introduction of the term “observant communication”, we will show in the following sections how the gradual emergence of the expectation structure can be described empirically.

2. Empirical description of the gradual emergence of the expectation structure

We have systematically identified three stages in the formation of the expectation structure. In a first step, the companies observe whether a cooperative venture could basically meet their interests. If this is the case, the expectation structure is further specified (second step) by observing both the competence and the behaviour of a potential cooperation partner. After the second step, if both companies still deem a cooperative venture as conceivable, they jointly start to evaluate the possible objectives and means of the cooperation. The result of the entire process of observant communication is a complex expectation structure.

a. Observant communication of common interests

Cooperative ventures in the software and pharma industries can either start accidentally on the basis of informal talks at conferences, trade fairs or special business meetings. It can also re-

sult through intentional planning, the latter being the case when one company has a specific idea and approaches another with a request for cooperation.

Regardless of how the first contact is established, in the initial phase, the companies face a widely unstructured situation of communication: the competences and knowledge-resources of the other company are largely unknown; the other company can turn out to be a competitor rather than a potential cooperation partner, and the strategic goals of the other company are uncertain.

The first step in forming an expectation structure consists of clarifying this open and unstructured situation of communication in a very rough and preliminary way. The companies exchange basic information and observe whether the other company is a competitor, a possible partner or of no interest at all. In this first step of observant communication, the companies build up the expectation to see the possibilities of collaboration and to find out whether a cooperative venture could basically meet their interests. The formation of this expectation is a necessary prerequisite to continue the communication process.

b. Observant communication of competence and behaviour

If the companies agree that a cooperative venture has the potential to meet their interests, the next stage of the formation of an expectation structure begins. In this stage, each company carefully observes the competences and the behaviour of the other company. This process of observation takes place after signing of a non-disclosure-agreement.

-Competence-

To clarify this aspect, we refer to an example from the pharmaceutical industry:

The pharma-company often starts its observation of the competence of a biotech company on the basis of written information that was sent to it. After assessing this information, the pharma company decides whether to start an intensive phase of evaluation or not. If the decision is affirmative, the biotechnological company is invited to present its technology before a scientific committee at the pharma company. Subsequent to the presentation, the pharma company establishes different subgroups that will analyse the technology of the biotech company in detail. Next, representatives of the pharma company visit the laboratories of the biotech-company to scrutinize the company's internal situation. Altogether, this process lasts between six and nine months. According to our interviewees, neither the pharma nor the biotech company are able to work out plausible plans for a future collaboration before this evaluation phase is completed. To be able to form a sustainable structure of expectations with regard to the competences of another company, it is necessary to know as much as possible about the potential of the other company's technology and its limitations.

-Behaviour-

The companies involved are aware of the fact that, due to its unpredictability, not all potential conflicts can be eliminated at the onset of the cooperation process. All interviewees empha-

sized the importance of flexible and cooperative behaviour for handling the uncertainty inherent in R&D-Cooperation. Therefore, in addition to competence, the companies observe the behaviour of a potential cooperation partner. The criteria that are applied by a company to assess the behaviour of another are more difficult to observe empirically than the criteria that are applied to evaluate competence. Interviewees say that during the process of observant communication, they rely on “gut feeling” and “cooperation-experience” in evaluating the behaviour of another company.

In our next research phase, we will develop a detailed concept for the objective analysis of the criteria used for evaluating behaviour. For the moment, we can only provide some preliminary results. One result is that the criteria to observe the behaviour of another company derive from experiences that a company has made in former cooperation processes. To clarify this point we will use an example from the software industry.

The interviewee told us that, in the initial phase of a cooperative venture, his company always wants to know how the other company would deal with unforeseen complications and difficulties in the collaboration processes. If the other company reacts to this question superficially and plays down the importance of potential conflicts, the interviewee’s company becomes sceptical about the trustworthiness of the other company. On the contrary, trust can be built if the other company takes this question seriously and designates appropriate mechanisms to deal with future conflicts. The acceptance of conflicts and the preparedness to deal with future conflicts in a flexible way seem to be strong criteria for evaluating the trustworthiness of another company.

c. Observant communication of the objectives and the means of the cooperation:

The distinction between normative and cognitive expectations

In previous sections, we described the emergence of expectations concerning the situational interests, the competence and the behaviour of potential cooperation partners. When these steps are completed, the mode of communication then changes. The companies do not only observe each other separately, but start to evaluate the cooperative venture with a joint perspective. Thereby, the expectation structure gains significant complexity, because the objectives and means of the cooperation start to become concrete.

Empirically, it can be observed that at this stage of the formation of an expectation structure the companies start to differentiate between normative and cognitive expectations, both with regard to the objectives and to the means of a cooperative venture. As mentioned above, this distinction helps the companies to deal with the uncertainty of the cooperation process. We will now proceed to clarify this point.

Generally, objectives that are expected cognitively have the same function as those that are expected normatively. They enable actors to allocate the means for a cooperative venture. The planning of the actual collaboration requires the determination of specific objectives. With regard to this function, it makes no difference whether the objective is expected normatively

or cognitively. In both cases, the overall uncertainty of cooperation is transformed into specific expectations of objectives and means.

With regard to the determination of objectives for a cooperative venture, however, normative and cognitive expectations differ in one specific aspect. In the case of cognitive expectations, the companies agree on the conditions under which they are prepared to react to the non-achievement of an objective by learning. In other words, where cognitive expectations are concerned, the companies are not committed by contract to accomplish a certain objective, as is the case with normative expectations. Objectives that are expected cognitively are based on hypothetical assumptions and are open to change.

Concerning the emergence of cooperation under uncertainty, the formation of cognitive expectations is of great significance in two respects: First, no company would accept to be committed to the accomplishment of objectives if their feasibility is questionable for scientific reasons. This is as cognitive expectations enable the companies to determine objectives for the cooperation without referring to contractual instruments. Second, the formation of cognitive expectations helps the companies to avoid conflicts, which necessarily emerge in the course of the cooperation due to the unpredictability of the process. The cooperation is kept flexible, as it is already settled before the actual beginning of the collaboration, in which cases the companies have to adapt to an unforeseen situation by learning instead of insisting on contractual agreements. Concerning the expectation structure that is about to emerge, the distinction between normative and cognitive expectations allows for higher degrees of complexity.

IV. DOCUMENTATION AND STABILIZATION OF THE EXPECTATION STRUCTURE

In the previous section we have described the emergence of an expectation structure in R&D cooperation. This expectation structure is documented in several ways. One classical instrument is the contract. However, in the exchange processes that we observed, the contract is not the only device for the documentation of expectations. Besides the contract there are other important documents such as research plans and project outlines. Sometimes of these documents are attached to the contract. At the same time, during the daily cooperation process, expectations are documented, e-mails are archived and telephone calls are summarized in written form. The processing of new information is structured by the expectations which have been written down as the point of reference for the cooperation. This documentation of expectations fulfils a vital function for the cooperation process and implies an enormous reduction of complexity for the cooperation process. Now, when dealing with unforeseen contingencies, the cooperation partners always have a starting point for their communication.

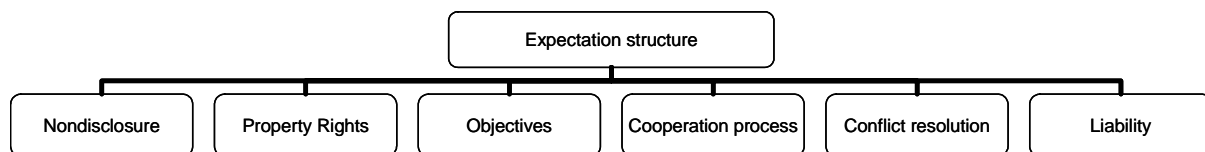
As already described, the emergence and stabilization of an expectation structure is imperative for cooperation under uncertainty. In the following sections, we will attempt to describe the central elements of the expectation structure in R&D cooperation on the basis of the information we have gathered in our expert interviews. First, we will distinguish six main categories of expectations. Subsequently, we will present specific expectations within the

most prominent categories in our interviews. After this delineation of the general expectation structure, we explore the fundamental mechanisms which serve as a stabilization factor. In the following two case-studies – pharma industry and software industry – we will discuss the central aspects regarding the expectation structure and we will try to show which expectations of the exchange partners can be considered as normative and which expectations are more cognitive. Finally, we will highlight the significance of a state-based legal system in stabilizing the expectation structure for both cases.

1. Basic categories of the expectation structure

At the present state of our research we have identified the following six basic categories of expectations in R&D cooperation: Nondisclosure, property rights, objectives, cooperation process, conflict resolution and liability (See graph 1).

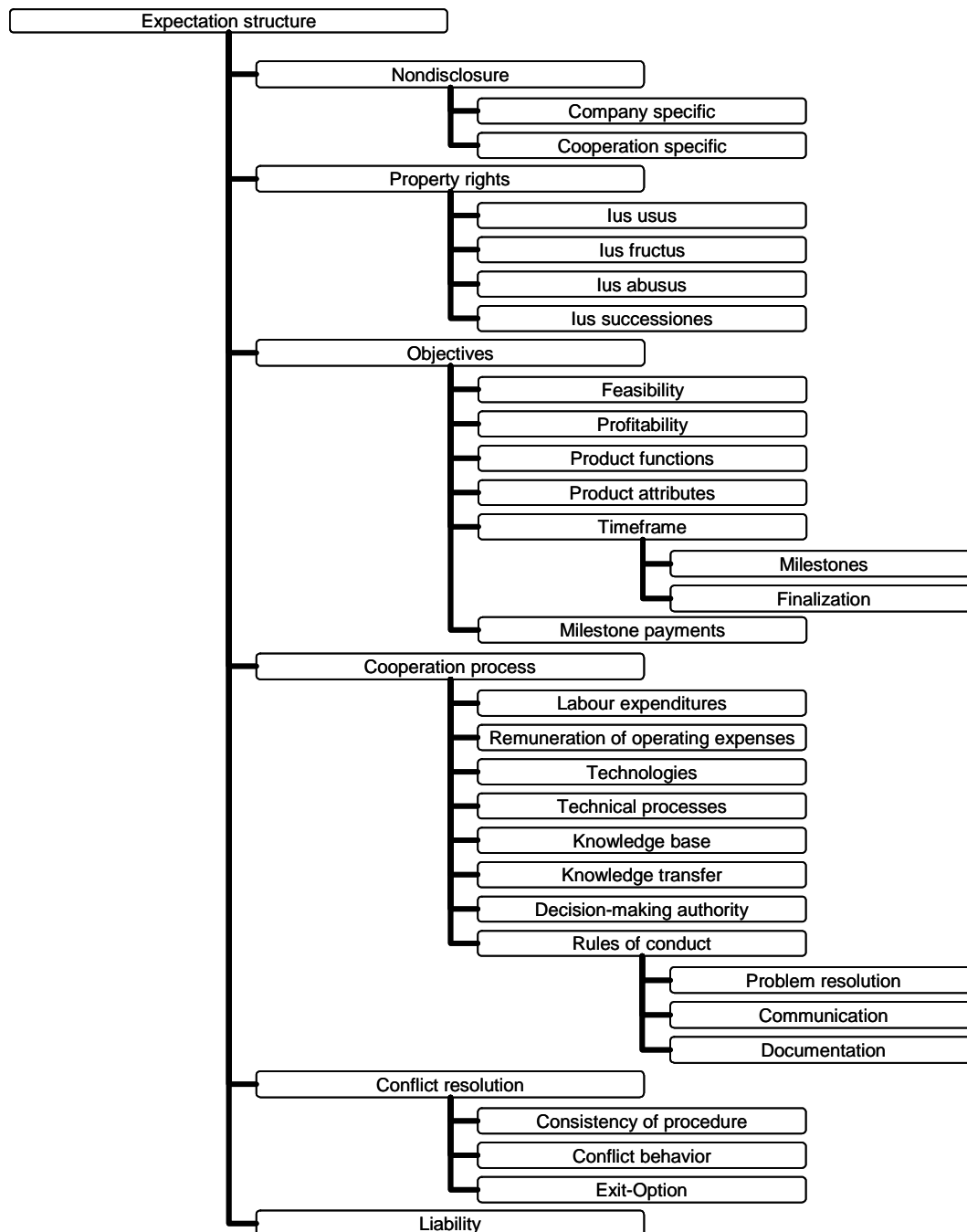
Graph 1: Categories of the expectation structure



In the category **nondisclosure** we include all forms of confidentiality agreements, both in the initiation of a cooperative venture and during the actual cooperation process. Expectations of nondisclosure include information concerning the exchange partner and the exchange relationship. Expectations with regard to **Property rights** comprise the right to use an asset (*ius usus*), the right to appropriate the returns from an asset (*ius fructus*), the right to change the form and substance of an asset (*ius abusus*), and the right to transfer each of the three previous mentioned rights to another party (*ius successionis*) (Furubotn & Pejovitch 1972, Mahnke 1997). All expectations with regard to the results of a cooperative venture fall into the category **objectives**. This includes abstract expectations such as the feasibility of the cooperation project or its direct or indirect profitability. It also includes more concrete expectations concerning a product which is to be developed jointly, such as the functions that a product should fulfil or certain attributes that it should have. Also, expectations with regard to the time schedule of the cooperative venture fall into the category **objectives**: The time limit for reaching certain milestones, and the time that the final product needs to be finished? In R&D cooperation we also see expectations of milestone payments connected to expectations of the time frame. The category **cooperation process** contains expectations with regard to the means and the workflow of the cooperation: The expenditures of human labour (number of employed workers and intended labour time) that each partner have to furnish to the cooperation, the remuneration of operating expenses (labour and equipment), necessary technologies and technical processes, the knowledge base that both partner agree upon as a point of reference and

the required knowledge transfer between the partners, decision-making authority and rules of conduct concerning cooperation aspects such as problem resolution, continuous communication and documentation of accomplished work steps. The next category is formed by expectations on **conflict resolution**. One of these expectations concerns the consistency of the procedure: Which instances have to be consulted when solving a conflict and what is their hierarchical ordering? More abstract are expectations with regard to the behaviour of the cooperation partner in the case of a conflict. The other expectation could be, for example, not to involve lawyers at the early stages of a conflict.

Graph 2: Expectation structure in R&D cooperation



Another expectation in this category, which plays a crucial role in R&D cooperation under specific circumstances, concerns the premature termination of a cooperation agreement. In some cases, cooperation partners wish to be able to end the cooperation if certain criteria are not met or if specific circumstances arise. This expectation can be formalized within an exchange relation by adding an exit clause to the contract. The last category is comprised of expectations concerning the **liability** of the cooperation partners. The question of who can be made liable if any damages arise out of a common product can be of utmost importance in certain industries. In these industries, the clarification of liability expectations is imperative for cooperation.

In graph 2 above we summarize the expectation categories discussed above, together with their most prominent elements. At the present state of our research, we cannot claim that the presentation of the expectation structure in R&D is complete. It is rather an attempt to structure our current results with regard to the complex process of expectation formation in R&D cooperation. The division of the expectation structure into basic categories, as well as the enumeration of the most relevant expectations, is not the result of a completed research project, but the basis for an ongoing research process.

2. Normative and cognitive elements of the expectation structure

In a large part of the above, visualized expectation structure is being formulated in the normative expectation style both in the pharmaceutical and the software industry. In particular, the expectation categories which constitute the framework of the cooperation contain exclusively normative expectations. This is the case for the above mentioned categories of “nondisclosure”, “property rights”, “conflict resolution” and “liability”. Cognitive expectations can be found in the categories “objectives” and “cooperation process”. Before illustrating further our distinction between normative and cognitive expectations by using the empirical data from our expert interviews, we need to address the issue of the stabilization of the expectation structure. For this purpose, we will distinguish between the mechanisms for the stabilization of normative expectations and the mechanisms for the stabilization of cognitive expectations.

a. Stabilization of normative expectations

The need to stabilize normative expectations calls for a mechanism that helps an actor expect that he can maintain his normative expectations concerning a cooperative venture. Presently, in our research, we observe four different mechanisms that can contribute to the stabilization of normative expectations: A state-based legal system, resource-dependency, reputation and trust. Of course, this enumeration must be understood as a preliminary attempt to describe at an abstract level the recurring patterns which we have observed in the exploratory phase of our research. Naturally, our observation has been guided by the existing literature on inter-firm relationships.

A state-based legal system enables the exchange partners to enforce their normative expectations documented in the cooperation contract. Decisive elements of this mechanism are the consistency of procedure, as well as the high degree of enforcement power (Weber, 1976).

Resource dependency, as we use the term, implies that all cooperation partners have a strong incentive to lead their cooperative venture to the desired result. (e.g: Hakansson and Snehota, 1995) A reason for this could be that all participants have invested a significant amount of resources (e.g. labour time) in the cooperation and that none of them can easily replace the desired result with an alternative solution. If this is the case, resource dependency can serve as a mechanism for the stabilization of normative expectations. This is because the participants can expect that none of their cooperation partners would risk a premature termination of the cooperation by evidently infringing upon the agreed expectation structure or by refusing to compensate for a disappointment of the normative expectations of others.

Another mechanism which we could observe as relevant in our exploratory research is reputation (e.g. Richter and Furubotn, 2003). Both in the software and the pharmaceutical industry, reputation constitutes an extremely important asset with regard to future exchange with clients and new cooperation partners. All of our interviewees stated their conviction that their cooperation partner could not afford to break an agreement, since the imminent reputation damage would also carry an immense economic damage.

From the insights gained in our interviews, we assume that **trust** can also be considered as a mechanism to stabilize normative expectations. Trust can be built up in the course of repeated transactions or mutual observation (see above and c.f. Luhmann 1968, 1984, Deutsch, 1973, Hakansson and Snehota, 1995, Nooteboom 2002, 2005). Trust in ones cooperation partner makes the consideration of disappointment of normative expectations so unlikely, that one does not consider its possibility and therefore does not provide for the eventuality of such, even though the actor acknowledges its factual possibility. (cf. Nooteboom, 2005) Nevertheless, if a disappointment of his expectations occurs, the only means the actor has at hand is to withdraw his trust, which would vitiate the trust mechanism for the cooperation.

b. Stabilization of cognitive expectations

Cognitive expectations are generally formulated in a hypothetical fashion (Luhmann, 1984). Even though in principle cognitive expectations are subject to change, they fulfil a crucial function in cooperative R&D processes. They extend the range of cooperation to processes where the feasibility or exact shape of the desired results is questionable from a scientific perspective. The development of an innovative product, of which the feasibility is merely based on scientific hypotheses, cannot be expected in a normative manner. Such normative expectations would render the cooperation impossible, since no company would agree to cooperate with an exchange partner who has normative expectations concerning cooperative results that are highly uncertain. The uncertainty of cooperative R&D ventures demands for the preparedness of the participants to revise and adapt certain expectations or to replace them with new

expectations. The capacity and readiness to learn is an imperative factor for the emergence of cooperative R&D processes. The uncertainty of these processes can be partially absorbed by the joint formulation of cognitive expectations in research plans, etc. These expectations can then serve as the point of reference during the development process.

Cognitive expectations are based on the actual state of knowledge, which is revisable according to specific scientific criteria. Therefore, the function of a mechanism to stabilize cognitive expectations cannot be intended to provide adherence to the expectations. Instead, the stabilization of cognitive expectations consists in the structuring of a course of action to be followed in the case of disappointment. The cooperation partner must know the conditions under which an expectation must be revised. The definition of these expectations falls in the domain of science, and the decision to learn or not to learn, i.e. to revise or not to revise an expectation, must be justified scientifically. For this process, the knowledge of reference can either be the knowledge which has been evolving in the cooperation or external knowledge resources. If a conflict arises, with regard to the necessity to revise expectations, the parties can resort to the judgment of an internal or external expert.

Whereas the development of an innovative product can only be expected in a cognitive fashion, the procedure of an eventual revision of this expectation can well be expected in a normative fashion: The parties can agree on which expert or expert committee to consult in the case of a conflict concerning the revision of an expectation and they can also commit themselves to follow the decision of the expert. These normative expectations can then be stabilized by one of the above described mechanisms for the stabilization of normative expectations. Cognitive expectations can thus be stabilized with the aid of the scientific system and the connection to normative expectations. The latter can be formal or informal. Informal or relational norms could prescribe, for example, cooperative and flexible behaviour in the case of unforeseen changes in the course of the cooperation.

In certain types of the cooperative ventures that we examined in our exploratory research, the exit-clause, already mentioned above, can be of particular relevance to stabilize cognitive expectations. The possibility of terminating a cooperation agreement under predefined circumstances enables the participants to allow for more uncertain expectations concerning the cooperation process, since they can expect to be able to abandon their commitments in a normative fashion if these uncertain expectations are disappointed. Still, the possibility to exit a cooperative venture is only part of the expectation structure in certain types of cooperation. In others, it might even be a normative expectation that any premature termination of the cooperation is made impossible.

V. CASE-STUDIES: EXPECTATION STRUCTURES IN THE PHARMACEUTICAL AND SOFTWARE-INDUSTRIES

In the following sections we will try to further illustrate our distinction between normative and cognitive expectations by using the empirical data from our expert interviews. Our result

with regard to the nature of the expectation structure differs between the pharma and the software industry. Therefore, we will deal with both cases separately. Since we focused our interviews on the cognitive elements of the expectation structure, we will concentrate on the expectations categories where cognitive expectations play a role. This is the case for the categories “objectives” and “cooperation process”. The second emphasis of this section will be placed on the relevance of the state-based legal system in stabilizing normative expectations. At this point of our research, with regard to the non-state mechanisms for the stabilization of normative expectations, we are hesitant to draw a comprehensive picture of their respective function and relevance. Nor is it possible for us at the moment to conceptualize an eventual linkage or interdependence of the four mechanisms. A closer analysis of these issues will be an important aspect of our further research.

1. Case-study 1: Pharmaceutical industry

In the category of expectations **objectives**, the cognitive style of expectation prevails. A very central aspect concerning this matter is that the feasibility of the desired result is itself uncertain. In many types of cooperative ventures in the pharma industry, the cooperation partners cannot act under the assumption that their efforts will ever lead directly or indirectly to some sort of profitable result. As with the development of a chemical substance to influence a given target structure, the specific attributes of the intended result of the cooperation cannot be expected in detail. There may be rather concrete expectations with regard to the basic functions that the substance must fulfil. These functions might even be formulated as normative expectations, but the precise nature of the required substance is still uncertain. Examples of expectations regarding the functions of a substance are that it positively influences the target structure, that it is non-toxic, storable and able to be converted into tablets. Besides the precise attributes of the product, an accurate completion date cannot be expected either. Depending on the success of certain steps of the process, the time frame may need to be altered by months or even years. Nevertheless, the expectation that there will be a milestone payment once a final or intermediate objective is attained can be of a normative kind.

With regard to the category of expectations **cooperation process**, we observed a heterogeneous picture of normative and cognitive expectations in the pharma industry. Expectations with regard to labour expenditures, remuneration of operating expenses, decision-making authority or certain rules of conduct can be expected in a normative fashion. Even the sequence of typical process steps can in a sense be expected normatively. This is much less the case with regard to the required knowledge base, the transfer of knowledge between the cooperation partners, and the technologies which need to be applied in order to obtain a certain result. All these issues are more likely to be expressed as cognitive expectations. The relevant knowledge base may change in the course of the cooperative process, the designated technologies can prove ineffective and the transfer of knowledge might fail due to a multitude of cultural or cognitive reasons.

A very precise example shall clarify our distinction between normative and cognitive expectations.

Example: Pharma-Biotech cooperation.

A biotechnology company and a pharmaceutical company cooperate to develop chemical substances which can influence specific target structures. In order to simplify, we can consider the target structure as a lock and the chemical substance as a key to that lock. The purpose of the cooperation is, in principle, that the Biotech Company delivers keys to locks furnished by the Pharma Company in the course of the cooperation. The distinction between normative and cognitive expectations in this case appears as follows: As general normative expectations that are defined in the contract, we find expectations aspects such as the nondisclosure of relation-specific information or the ownership of the possible results of the cooperation (patent law). With regard to the cooperation process, it can also be stated in the contract that the Biotech Company must develop a certain amount of keys corresponding to the same amount of locks furnished by the Pharma Company. Here, we assume the number to be 10. In the same manner, the remuneration can be fixed in such a way that the Biotech Company can expect a payment each time it delivers a key to a lock. Thus, the Pharma Company can normatively expect that it will receive 10 keys in the course of the cooperation and the Biotech Company can normatively expect its remuneration upon delivery. However, the Biotech Company can only have cognitive expectations with regard to the precise nature of the lock it has to deal with. At the same time, the Pharma Company can only cognitively expect the feasibility of one key to a lock. The Biotech Company has the right to refuse a lock if it can bring forward scientific reasons that justifies its refusal. This aspect merits further attention.

If a conflict arises concerning the feasibility of a process step – as in our example, the development of a key to a lock– the conflict can only be solved by resorting to the scientific system. In the contract, the parties can agree on the procedure that should be followed in such a case. In-house or external experts can be nominated in the contract to decide on the subject matter. They decide whether a party can stick to their expectations or whether it has to revise them. In enforcing the expert decision, it generally suffices that the parties desire to maintain their reputation and image as experts in their field. The reputation damage for a company would be disastrous if it refuses the continuation of a R&D project that an expert committee has judged feasible. Of course, the enforcement of the expert decision can also be assigned to a state-based legal system. However, in our example described above, often, it is not in the interest of one party to force the other by any means to continue a R&D project, if the latter has already tried to abandon it. In this case, the damaged party would rather choose to exit the cooperation than to actually enforce its claims. In this context, it is the normative expectation of the exit option which helps to stabilize the cognitive expectations with regard to the feasibility of an R&D project.

Other interesting aspects arise from a thorough analysis of the reasons why one party in a cooperative venture would bring up scientific reasons in order to justify its refusal of a work step. Evidently, the refusal can also have its root in a cost benefit analysis. If we refer again to our example, for the biotech company the development of a specific lock might prove extremely expensive and not profitable in view of the milestone which is fixed in the contract. Thus, in this context, there is a thin line between scientific and economic reasoning. The degree to which a cooperation partner puts his efforts into an uncertain venture can hardly be expected normatively. In the pharma cooperation, a conflict can arise when one party suspects the other of unnecessarily slowing down the development process. This might well be due to strategic reasons. To deal with this eventuality, the companies can agree to include a specific clause in the contract obliging them to proceed to the assigned tasks with “commercially reasonable efforts.” If a conflict then arises with respect to the efforts of one of the cooperation partners, it is again up to scientific experts to judge the affair.

Support function of the state-based legal system

In the types of cooperative ventures that we have examined in the pharma industry we could observe that numerous normative expectations are already stabilized with the aid of one or several non-state mechanisms (resource dependence, reputation, trust). Thus, the support function of the state-based legal system is relevant only for certain specific expectations which, nevertheless, turn out to be decisive for the entire cooperation. The all-dominant category of expectations in the pharma cooperation we examined is property rights. Expectations with regard to all different types of property rights are exclusively normative and, with regard to the stabilization of these expectations, the contract parties rely necessarily on a state-based legal system which has full enforcement power. The reason for this necessary reliance on the state surely lies in the extraordinary configuration of a pharma cooperation. As we have pointed out several times, the feasibility of the joint objective is uncertain. Many cooperative ventures end without any utilizable result. The cost of this trial-and-error process can only be afforded if one process eventually leads to the development and commercialisation of a new drug, but this is only the case once in 10.000 trials. As a consequence, expectations with regard to the property rights of a new drug have to be clarified with the utmost reliability. Otherwise, the entire R&D process could not be financed. In this particular context, incentives for opportunistic behaviour are so strong that the expectations with regard to property rights cannot be sufficiently stabilized by non-state mechanisms.

In the development process of a new drug, costs can go up to 800 million euros and potential sales can reach several billion euros. If a conflict with regard to property rights arises shortly before the drug is launched, it can ruin the damaged company. For instance, this can be the case if a pharma company cooperates with a smaller biotech company which is taken over by a competitor of the former company during the cooperative development process. In these cases, the support of a state-based legal system is inevitable to avoid the premature ter-

mination of the cooperative venture, which would imply enormous sunk costs for the pharma company.¹

2. Case-study 2: Software industry

With regard to the relevance of cognitive expectations in the categories of expectation **objectives** and **cooperation process**, the results from our expert interviews in the software industry differ from those in the pharma industry. Altogether, cooperative R&D processes in the software industry are better amenable to planning and can thus be easier translated into normative expectations. As already mentioned, the theoretical feasibility of a cooperative venture in the software industry, once the companies have evaluated their resources, is not doubtful. The cooperation partner can act under the assumption that a desired objective can, in principle be obtained. Uncertainty exists rather, with regard to the date of completion of a cooperative process and with regard to its exact properties. As was the case in the pharma industry, the cooperation partners can formulate quite precise normative expectations concerning the desired functions of the product in question. These normative expectations of the functional building blocks of a common product constitute the cornerstones of cooperative ventures in the software industry. An example of such functional modules is a system that is designed to process and transform a given amount of pictures in a prescribed time limit, and with the capability of printing and e-mailing the resulting data afterwards. Also, specific requirements with regard to the user surface of a program can be determined in advance.

Whereas in the pharma industry the uncertainty of the cooperative process is an inevitable fact, cooperation partners in the software industry often agree to refrain from planning too many details beforehand, due to reasons of efficiency. Since the exact planning of the cooperative process prior to its actual beginning would consume tremendous amounts of time and money, certain expectations are intentionally left unspecified. To stabilize these uncertain expectations, normative expectations with regard to conduct (rules of conduct) are very important in the software-industry. The importance of intensive and continuous communication to adapt the expectations to the reality of the cooperation process and the necessity to solve problems in a cooperative manner are especially translated into rules of conduct (or relational norms). Communication, flexibility and cooperative behaviour in problematic situations constitute the decisive normative expectations which enable the cooperation partner to allow for more uncertainty in their cooperative R&D processes.

Support function of the state-based legal system

As illustrated above, relational norms play an important role in cooperative software development processes. However, the state-based legal system is hardly effective in stabilizing these normative expectations. As a preliminary result from our expert interviews we can thus

¹ As we have already pointed out, in other types of cooperation exit options can explicitly be part of the joint expectation structure.

retain the idea that the support function of the state-based legal system is of minor importance, whereas non-state mechanisms play a very significant role in this respect. Reputation is a particularly powerful instrument, since successfully completed cooperative projects serve as a valuable reference for software companies. An intensive exchange of information concerning past cooperation partners is very common in the software industry.

Resource dependency can also serve as a stabilizing mechanism. The continuous communication and technical integration required in the cooperative development process can provoke a feeling that the cooperation partner is irreplaceable.

Many of our interviewees expressed the opinion that state courts are not capable of sufficiently comprehending the complex nature of cooperative development processes in the software industry and, therefore, are prevented from finding an adequate solution to a conflict. As a consequence, parties often have to expect long delays in court procedure and, in the end, most of the times they have to accept a settlement. Nevertheless, there is an expectation that is indeed stabilized by the existence of a state-based legal system: The parties can only argue within the limits of the project defined in the contract. The possible damage to any of the parties can never exceed the size of the cooperative venture which has been initially agreed upon.

The category of expectations **liability** takes an exceptional position for cooperative ventures in the software industry. Software products assume a vital function in many different industries and other central areas of social life. Hence, the breakdown of software systems can cause considerable damage. Since software systems tend to be increasingly complex, many different companies have to cooperate in their programming. In this case, liability issues are of utmost importance in the initial phase of a cooperative venture. Who should be made responsible in the case of a malfunction or even a breakdown of the entire system? With regard to liability issues, companies do not solely rely on non state-mechanisms to stabilize their normative expectations, but include the state-based legal system explicitly in their contracts.

VI. CONCLUSION

Our empirical study on the emergence of transnational R&D Cooperation in the pharmaceutical and the software industries is only partly consistent with the above developed hypothesis that the uncertainty in transnational cooperative ventures is reduced by cognitive rather than by normative expectations. Cognitive expectations reduce the uncertainty for the actors who are involved in a cooperative venture only with regard to the categories “objectives” and “cooperation process” of the expectation structure (see above, p. 13). This is due to the fact that in innovative R&D ventures, the means and objectives of the cooperation cannot be exhaustively translated into written contracts. With regard to the categories “non-disclosure”, “property rights” and “liability” of the expectation structure, the uncertainty inherent in the cooperation is reduced by normative expectations (see above, p. 13). Hence, in contrast to the prediction made by Luhmann in the early 1970s, today, normative expectations still play a vital role in the facilitation of transnational economic cooperation.

With regard to the role played by the state in the provision of legal certainty to economic actors involved in transnational cooperation processes, our study reaches a clear result: the state's private law is only of minor importance. In transnational R&D cooperation, normative expectations are predominantly stabilized by non state mechanisms (reputation, resource-dependency and trust). Therefore, the objective of further research begs for a more detailed examination of non-state mechanisms that reduce the uncertainty inherent in transnational exchange processes. Particularly the literature on "private ordering" (Aviram 2003; Benson 1999, 2003; Bernstein 1992; Ellickson 1994, 2001; Greif 2006) and the literature on "relationship management" (Macneil 1971; Dwyer, Schurr & Oh 1987, Hakansson & Snehota 1995) seem to be adequate for the analysis of the support-structures that facilitate the emergence of transnational cooperative ventures.

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