

Towards a dynamic institutional economic framework for the greening of industry

# Organising Interfirm Learning

**Wie beeinflussen wechselseitige Abhängigkeiten und Lernprozesse zwischen Unternehmen die Ökologisierung der Wirtschaft? Der hierzu vorgeschlagene konzeptionelle Rahmen basiert auf dynamischen Theorieansätzen der neuen Institutionenökonomik. Lernen zwischen Firmen findet teilweise durch den bewussten Aufbau von Kooperationskapazitäten statt; teilweise durch Anpassung, indem Firmen ihre Innovationsaktivitäten entweder vor oder nach der Innovation mit anderen Unternehmen koordinieren. Die empirisch relevante Folge ist, dass das „Greening“ der Wirtschaft durch Schwierigkeiten, die notwendigen Koordinations- und Lernprozesse innerhalb und vor allem zwischen asymmetrisch grüner werdenden Firmen zu organisieren, beeinträchtigt wird. Dieses Marktversagen macht die Verzögerungen des Greenings verständlich und deutet zugleich auf Möglichkeiten, diese zu überwinden.**

**T**he recent rise of greening as a corporate issue forms a part of what some environmental researchers see as the emergence of a new green techno-economic paradigm (1). The greening process is seen as revolutionary in character, entailing a paradigm shift resulting in major cognitive and technological changes. This paradigm change is expected to have thorough structural effects for the whole economy. But how does the green trend, pushed forward by the political system, diffuse on the market and affect interfirm dynamics?

This paper investigates how firm interdependencies and the related interfirm learning influence on the greening process. It seeks to present an analytical framework of interfirm learning based on the as yet immature dynamic neo-institutional economic theories. This approach brings attention to the system failures related to the greening of industry. Interfirm learning gains significance in efforts to understand the retardation of the greening process.

The paper takes a constructive approach. It focuses on theory development and in presenting the core elements of a conceptual framework of interfirm (green) learning rather than in criticising existing theoretical or empirical work. The theoretical development is inspired by an empirical analysis based on in-depth case-studies of green interfirm learning processes between two Danish paper mills and their suppliers, customers and competitors (2).

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## ► Theoretical Background

In accordance with the newer but immature tendencies within innovation oriented economic theories, the paper seeks to synthesise the strategy approach of the resource based theory with evolutionary economic theory in order to intersect notions of economic organisation, learning, strategy and dynamic market processes. In doing so, more emphasis is placed at the firm level than is usual within evolutionary economic theory which has a strong focus on explaining broader phenomena of paradigm changes and lock-in, but which neglects explaining firm strategic behaviour. The theoretical perspective pursued here may also be designated as „knowledge based theory of the firm“.

More specifically the theoretical discussion contributes to building a more dynamic transaction cost theory. The approach joins with authors who are seeking to integrate transaction cost and capabilities explanations in the attempt at developing a more dynamic neo-institutional economic theory (3). A neglected aspect of interfirm learning is thus to focus on the costs of respectively building in-house capabilities versus using market capabilities. But the paper also contributes to building a stronger microtheoretical foundation for the (national) innovation systems approach (4).

The core idea pursued in this paper is to extend the knowledge based theory of the firm to the interfirm level. While the theory of the firm usually

concentrates on explaining firm specialisation and integration, it is here argued that it can equally well provide a theory of interfirm learning. The knowledge base theory is here used to explain how larger groupings of firms, e.g. clusters, value chains, and regional and national innovation systems, react to change, such as the green trend.

The paper outlines the contours of a (primarily) knowledge based theory of (green) interfirm learning. The framework should inform us on when we have interfirm learning and why it differs in intensity in different firm relations. In this short paper, there is however only room for some main elements of the framework and emphasis is here placed on the incentive side while the cost side is neglected.

The green trend may be analysed similar to other paradigm and technological trajectory changes on the market, such as e.g. the introduction of electricity, new business practices related to IT-technology etc. which innovation theory seeks to address already. But investigating the greening of industry does have its particular characteristics. The greening of industry is an innovation process that is distinct in character in four ways: It is radical, systemic, associated with considerable information problems and highly politically influenced. The greening process therefore entails a mixture of lower order learning (exploitation) and higher order learning (exploration) and incremental as well as very radical innovation. Consequently, the greening of the economy gives rise to high interfirm co-ordination needs.

The paper first briefly discusses interfirm learning from the perspective of economic organisation. Then it moves on to discussing firm self-sufficiency and co-operation needs when it comes to production and learning at a general level. Thereafter, the three processes of interfirm learning are presented, respectively capability accessing, ex ante and ex post co-ordination.

## ► The economic organisation of production and learning

Many studies of both informal and formal interfirm learning, also those outside innovation theory traditions, implicitly or explicitly apply a capability explanation of interfirm learning. Thus it is commonly assumed that, at base, firms do interfirm learning because they want to access other firms' capabilities, possibly designated skills, know-how or knowledge. But we need an explanation for why firms choose to access other firms' capabilities rather than building these themselves

or alternatively integrate with those firms who hold the desired capabilities. Interfirm learning must be seen within the overall organisation of production and learning on the market.

In the face of change markets may be contemplated of as a system for the co-ordination of the growth of knowledge (5). The firm is a domain for learning within which resources are developed and deployed (6). Firms from this perspective may be seen as a function of the degree of specialised knowledge brought under control and the accessibility to knowledge outside the firm, as explained notably by Richardson (7). Richardson, in his seminal article „The Organisation of Industry“ (1972), made a distinction into two categories of productive activities. Activities requiring the same or closely related capabilities are similar, in contrast to complementary activities, which are interdependent and typically situated in adjacent stages of production.

This argument provides a knowledge based theory of the firm. There is a tendency for firm activities to centre around specialised knowledge or „similar capabilities“ which increases the co-ordination need on the market. Firms only have the capacity to carry out similar activities based on similar capabilities, since incorporating „dissimilar“ activities would lead to diseconomies of scope and/or increased information costs. Firms will often benefit from spinning-off dissimilar activities leaving these to other firms. Thus there are limits to the capabilities a firm can handle efficiently; an argument that forms the basis of modern resource based theory.

But Richardson's argument can also be extended to inform us on the relative distribution and value of capabilities between firms and thus on the incentives to do interfirm learning from a capabilities perspective. There are, presuming human rationality is bounded, limits to how much knowledge should be brought under firm control. Accessing them on the market may be much more attractive than control. It may sometimes be more effective if the firm does not try to control certain capabilities, but leaves decision to those who know better. Access, rather than control, is particularly attractive when it is uncertain what capabilities will prove valuable in the future; for a firm can access much more than it can control.

Below in the table Richardson's argument is extended to discuss which activities a firm should co-ordinate internally and which subject to co-operative efforts and with whom.

Table 1: Linking the division of labour to the division of capabilities		
Activities	similar	dissimilar
complementary	internal co-ordination	vertical interfirm learning
independent	horizontal interfirm learning	no interfirm learning

Source: Andersen 1999 (see reference 2)

The capability concept is implicit in the table, as it, in Richardson's definition, is entailed in the „similar/dissimilar activities“. The table should be interpreted as a dynamic model, which outlines some very basic incentives for firms to do interfirm learning, respectively integration in different firm constellations. The degree to which this actually happens depends also on other factors such as the costs of doing interfirm learning. Below in the discussion of the three suggested processes of interfirm learning the table will be explained more closely.

### ► Three processes of (green) interfirm learning

Interfirm learning I see as made up of the direct – or interactive – information flows occurring as a part of either capability building or adaptation processes between firms. I use the term capability accessing to refer to interfirm intentional search aimed at capability building, that is capability building through knowledge exchange or collaborative knowledge generation with other firms. Learning through adaptation I see as information exchange, in the form of communication, persuasion and teaching associated with the co-ordination of productive activities. Furthermore, I am proposing that there are two different types of co-ordination processes leading to interfirm adaptation, respectively ex ante co-ordination and ex post co-ordination. The latter distinction serves to emphasise the time element of when firms co-ordinate their innovative activities. The three interfirm learning processes are closely intertwined. Central for the distinction between the interfirm learning processes are firms' immediate incentives to engage in interfirm learning.

The point made here is that all three interfirm learning processes contribute to overall interfirm learning, including interfirm greening. The interfirm information exchange and pressures resulting from these three interfirm learning activities influence the rate and direction of innovation by shaping firms' knowledge bases, firms' heuristics and their entrepreneurial expectations. This shaping may take place at many levels of the firm. Much of the interfirm interaction takes place at

the shop floor entering imperceptibly into firm routines and may take a while before it reaches the overall strategic level of the firm.

### ► Capability accessing

Capability accessing refers to the linking up between given firms with the purpose of building capabilities; it is co-operative search, entailing knowledge exchange or shared knowledge building (collaboration). It may take on formal partnerships, but informal knowledge exchange is much more widespread than formal partnerships (8).

I propose that there are three kinds of interfirm learning constellations. Firms have incentives to access:

1. the capabilities of firms with *similar activities* because their capabilities are also similar (e.g. paper industry – paper industry),
2. the capabilities of firms whose activities and capabilities are *complementary* (e.g. paper industry – chemical industry), and
3. those whose *activities* are *independent* but where the *capabilities* are (nearly) *similar* (e.g. paper industry – other process industry).

Between other firm constellations there are no incentives to do capability accessing. The three firm constellations differ with respect to the overlap between adaptation and capability access needs and the need for protection of the intellectual property. The *green capability accessing* represents the knowledge migration between firms horizontally and vertically, related to their green technical but also organisational capability building, e.g. environmental management systems.

### ► Ex ante versus ex post co-ordination

The question raised here is when firms co-ordinate their innovative activities in the innovation marathon? Does it take place early, influencing on the creation of variety, ex ante the innovation (ex ante co-ordination), or does it take place later, ex post the innovation, seeking to make the varieties, i.e. innovations in different firms, compatible (ex post co-ordination)? The distinction thus serves to emphasise the neglected time element in the firm-market interaction.

Ex ante and ex post co-ordination refer to two different strategies. *Ex ante co-ordination* refers to attempts to secure co-ordinated adaptation between firms with complementary activities. The purpose is to secure that market capabilities are always there when needed and that interrelated firms stay on the same wavelength on parameters critical for competitiveness such as capabilities or image. Ex ante co-ordination emphasises thus the ongoing but conscious adaptation attempts between producers and users, involving either cooperative or coercive communication of information on user demands and product properties. Ex ante co-ordination thus influences the very early stage of the innovation marathon. It is theoretically a very neglected issue.

Empirically, the *green* ex ante co-ordination consists mainly of the green demand setting processes, the explicit pressures, requests and inquiries, between suppliers and customers. Included in this process is the institutional response of firms to the requirements, the „green profiling“ which is undergoing change as firms invest in green information standards, such as certified management systems, eco-labels etc., as they seek to economise on their green transaction costs.

*Ex post co-ordination* focuses on co-ordination efforts arising from interfirm conflicts related to incompatible products or activities. The variety of innovations, i.e. occurring ex post the contemplation of a given product innovation, are sought made compatible. The conflicts arise when innovation renders the market capabilities obsolete and incompatible products or activities need to be co-ordinated. Ex post co-ordination takes place in the mature phase of the innovation marathon. It is carried out through the exercise of authority in the form of persuasion or teaching.

The *green* ex post co-ordination activities consists of persuasion and teaching on environmental issues between firms with complementary but incompatible products or activities. An example is products influencing negatively on the recyclability of paper which are in conflict with the paper maker.

### ► The relationship between the three learning processes

The distinction between the three interfirm learning processes clarifies the dynamic firm-market relation. The co-ordination and capability building processes are to some extent alternatives. A firm may choose between building certain capabilities themselves, or engaging in ex ante or ex

post co-ordination in order to get other firms to undertake a part of the innovation. Firms may also choose between pursuing either a primarily ex ante or ex post co-ordination strategy towards changes in the selection environment. The choice between these strategies depends on the (dynamic transaction) costs and risks involved in pursuing the different strategies. Ex post co-ordination is much more difficult, partly because it addresses a conflictual situation, partly because it mostly takes place between parties with no or limited interaction and thus no relational assets. Investing in substantial ex ante co-ordination may be very costly, but may in the long run show to be a cost-efficient co-ordination as the more difficult co-ordination situations are prevented.

### ► Conclusion

A knowledge-based framework for analysing interfirm greening dynamics has been suggested here. It is a microtheoretical framework that outlines the incentives and costs structures that firms experience as they seek to organise their production and learning efficiently in a changing, in this case greening, selection environment. The greening of industry may only be explained by incorporating all the three suggested processes of interfirm learning, ex ante co-ordination, ex post co-ordination and capability accessing. Together they encompass how firms seek to organise their production and learning efficiently across interdependent firms which face each their conditions and opportunities towards the changing selection environment. The approach forwarded here em-

phasises the interplay between the three interfirm learning processes and calls for the need to see these in their interplay.

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