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Networks, capabilities, and competitive advantage*

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Abstract

This conceptual paper joins network theories of firm interaction with the recent resource-based perspective in strategic management. This suggests a more satisfactory underpinning for the analysis of competitive advantage within the network approach. In other words, application of the resource-based approach suggests one way to uncover the sources of competitive advantage of the network firm. The paper also makes the related point that network theorists stand to benefit from the Marshallian tradition in industrial economics, a point that has sometimes been made by network theorists, but has never or seldom been elaborated. © 1998 Published by Elsevier Science Ltd. All rights reserved.

1. Introduction

Much has been written lately about the competitive advantage of industrial districts, regions and even nations. Examples include, and inspiration has been drawn from, such successful but controversial tomes as Michael Porter's "The Competitive Advantage of Nations" (1990), Alfred Chandler's "Scale and Scope" (1990), or Michael Piore and Charles Sabel's "The Second Industrial Divide" (1984). The overall insight that has emerged from these studies is the recognition that quite often firms' commercial success on the international scene is strongly conditioned by their belonging to a certain geographically bounded collectivity of interacting firms.

In this paper I link up with this emerging theme. I shall do so from a perspective that is, I believe, novel, since I draw my inspiration from both *the network approach* associated with a group of primarily Swedish researchers (for example, Johanson and

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Mattson, 1987; Håkansson, 1987, 1993; see also the contributions in Grabher, 1993)¹ and the recent *resource-based perspective* within strategic management (Wernerfelt, 1984; Barney, 1986; Dierickx and Cool, 1989; Peteraf, 1993).²

At first glance, these two approaches are poles apart: the resource-based perspective is solely occupied with analysis of the individual firm's bundle of resources (in terms of their ability to contribute to competitive advantage), and has next to nothing to say about inter-firm relations. In some of its incarnations, the resource-based perspective draws heavily on standard economics (Peteraf, 1993). The primary research interest to the network approach is on the other hand to identify, categorize and theorize (network) relations between industrial firms. The network approach has drawn much inspiration from, for example, sociological exchange theory. So the differences seem to be more numerous and more pronounced than the similarities.

However, I argue that it is in fact possible for network theorists to draw in a fruitful way on resource-based insights (and probably also vice versa; see Foss and Eriksen, 1995). In particular, the concept of "collective learning" introduced by Håkan Håkansson (1993) provides one possible bridge between the two approaches. Intuitively, the collective learning produced by firm interaction may under certain circumstances be a *rent-yielding asset* to network firms. In a way this link is suggested by the title of Håkansson's essay: "Networks as a Mechanism to Develop Resources". This is one aspect of what I am going to look at. More precisely, I shall, equipped with the analytical categories of the resource-based perspective and the network approach, aim to uncover the sources of competitive advantage of the network firm. In other words, this paper may be seen as suggesting paths of further theoretical development of the network approach.

I begin by discussing the subset of resources known as "firm capabilities". Briefly, these are intangible assets that represent what the firm knows about the production of goods and services, and the organization of that production.³ These capabilities are inherently tied to the interaction of agents within the firm, and may include firm learning capabilities (see Nelson and Winter, 1982; Teece et al., 1991; Langlois 1992; Foss, 1993; Loasby, 1993).

¹It should be recognized that there is also an American network approach, and that the network approach(es) is (are) very much part of a general international increase in interest in inter-firm relations. Much of this interest is reflected in recent writings on industrial districts, the competitiveness of nations and regions, the debate on "Fordism" vs "flexible specialization", "national innovation systems", etc. However, in order to keep the focus relatively narrow, I here primarily refer to the Swedish research.

²There are numerous theoretical allies to the resource-based perspective, such as "the capabilities view" (Richardson, 1972; Langlois, 1982), "the competence perspective" (Penrose, 1959; Foss, 1993), and evolutionary economics (Nelson and Winter, 1982). Standard contractual economics (Williamson, 1985) is also clearly related to the resource-based perspective (cf. Peteraf, 1993).

³Strictly speaking, the firm cannot "know" anything about production and organization of production; only individuals know. However, the terminology is used here to indicate that on the other hand no single person has complete and precise knowledge about all the relevant aspects of the firm's activities; this knowledge resides in the interaction between agents inside the firm.

I then turn to the notions of “collective learning” and “network capabilities”. These terms refer here to what collectivities of firms — networks — know about the production of goods and services, the organization of this production (network capabilities), and how they learn about it (collective learning). In discussing this, I draw on the Marshallian tradition in industrial economics. I also apply resource-based insights to the analysis of network capabilities and collective learning, examining under which conditions such capabilities may contribute to the sustained competitive advantage of firms that participate in a network. It is found that application of resource-based reasoning strengthens the managerial prescriptions that have emerged from network research.

2. Firm capabilities

It is convenient to begin the discussion with firm capabilities, because the analytical categories of the capabilities (and the resource-based) perspective have traditionally been developed in terms of these. Another reason, which is more a matter of explanatory logic, is that capabilities belonging to networks of firms clearly emerge from the interplay of firm capabilities; not the other way around (although network capabilities may influence firm capabilities).

2.1. *Penrose, Chandler and Lazonick*

Almost everybody would acknowledge that the capabilities perspective on the firm begins with Edith Penrose. In her for a long time and strange reasons overlooked 1959-contribution, “The Theory of the Growth of the Firm”, Penrose argued that it is only possible to understand such crucial issues as diversification and the pursuit of corporate and business strategies in terms of underlying endowments of capabilities that make firms essentially heterogenous and path-dependent entities.

In her story, firms are characterized by a tendency to accumulate surplus resources, whether physical, human or organizational. This is largely a matter of the experience and learning effects — relating in particular to the management term — that are a joint-product of the firm’s normal activities. The relevant learning effects become embodied in capabilities, and it is these that fundamentally differentiate firms and codetermine their opportunity sets, the set of profitable actions that the firm can recognize and exploit. To a large extent, this opportunity set is a matter of diversification that is “close in” to the firm’s existing activities, where diversification is a matter of the utilization of surplus resources.

Other theorists, such as Nelson and Winter (1982), have conceptualized the firm in a similar manner. But the person whose understanding lies perhaps closest to Penrose’s understanding is not an economist. but “the dean of business historians”, Alfred Chandler (1990). Like Penrose, Chandler strongly emphasizes that obtaining favorable competitive positions is largely a matter of the leadership and organization required to exploit economies of scale and scope (Chandler, 1990, 24). Where Chandler and Penrose may differ lies in Chandler more explicitly seeing the large firm as an

entity which primarily exists because it is a superior seedbed for innovative capabilities. That is to say, he places more emphasis on what we may call *dynamic* firm capabilities (Teece et al., 1991), as distinct from the traditional *static* firm capabilities (relating to scale- and scope-economies). Firms are more than transaction cost reducing responses to market failure; large firms *define* new markets and resource uses.

William Lazonick (1991) sharpens this idea, arguing that “the market” — which for Lazonick seems synonymous with the perfect competition markets of textbooks — is *always* characterized by markedly inferior innovation capabilities relative to the large firm. The decentralized network of the market presumably is unable to undertake and coordinate (complementary) innovations, both as a matter of theory and of history.⁴ Thus, Britain’s relative economic decline since the turn of the century is explained by arguing that the strongly decentralized structure of British industry made impossible the introduction of the largely complementary organizational and technical innovations that made American firms prosper.

2.2. Limitations of the Chandler–Lazonick story

Although it is presented as a general theory (particularly by Lazonick, 1991), the Chandler/Lazonick story is not general. First, Chandler and Lazonick implicitly argue that the large corporation is a rather flexible creature. But as Nelson and Winter (1982) point out, the accumulation of capabilities entails more than the flexible ability to, for example, diversify into related activities; developing capabilities also has a negative aspect to it. During their existence, firms acquire a repertoire of “routines”, and “routines are the skills of an organization”. However, such routines introduce path dependence and therefore inflexibility.

Another short-coming, which perhaps applies more to Lazonick’s story than to Chandler’s, is a general lack of sensibility to other forms of economic organization than either “the market” or the large firm. This runs totally counter to the enormous evidence of all sorts of cooperative relations between firms, and the economic viability of “. . . the dense network of co-operation and affiliation by which firms are inter-related” (Richardson, 1972, 883). That Chandler and particularly Lazonick operate with an impoverished conceptualization of “the market” may be brought into sharper focus if we consider a tradition that emphasizes that market or industries may be bodies of productive capabilities much in the same way as firms. This tradition is largely Marshallian (see Marshall, 1925; Richardson, 1972; Langlois, 1993; Loasby, 1990, 1993). And in many dimensions this tradition dovetails with the basic thrust of the Swedish network tradition.

⁴As Richardson (1960, Ch. 4) shows this is a correct assertion with respect to the stylized markets of the perfect competition model. However, Lazonick infers from this that only the vertically integrated corporation is capable of coordinating complementary innovations. As Richardson’s work (1960, 1972), and work on firm networks in general, also demonstrate, this is a non sequitur.

3. Network capabilities

3.1. Levels of analysis

It is convenient to again refer to recent writings on why particular geographically defined entities — such as regions, districts, or nations — may prosper or lag behind. The firm capabilities view associated with Chandler and Lazonick puts the explanatory emphasis on the accumulation of firm capabilities, particularly as this accumulation process is influenced by patterns of economic organization and managerial mind-sets (Chandler, 1990; Lazonick, 1991). Macroeconomic discussions will emphasize the savings rate and/or the cost of capital. In fact, much of the recent discussion is either a matter of a micro (firm) perspective or a very high level of aggregation.

But there has long been a tradition in which competitive advantage was not seen in either strict micro or strict macro terms. Instead, the “meso” level was factored in. This is what unites otherwise quite different theories on, for example, “clusters” (Porter, 1990), “technology districts” (Storper, 1992), “national systems of innovations” (Lundvall, 1992), and “industrial districts” (Pyke and Sengenberger, 1992). Such notions all refer to some close interaction between firms, and to the presumption that firms may derive competitive advantage vis-à-vis firms from other regions, districts or networks precisely because of their “membership” to a certain geographically bounded entity.

One basic problem with much of this literature is that the sources of competitive advantage are not really accounted for. Furthermore, the causal links between these sources and competitive success are essentially unidentified. For example, industrial districts are seen to promote “entrepreneurial dynamism”, “flexibility”, and “trust and co-operation” (Pyke and Sengenberger, 1992, 5), which in turn allows vertically disintegrated structures to persist. Allegedly, this promotes a type and amount of innovative efforts that cannot be achieved by the large vertically integrated firm. But what precisely is the nature of the capabilities that emerge from the interaction between firms in the network? How do they emerge? How do they contribute to the competitive advantage of the industrial district? If they do contribute to competitive advantage, why aren't they imitated by firms in other countries/districts? etc. Such questions are basically unanswered in most of the literature.

The Swedish network approach is not completely immune to a similar critique, either; clearly, there is a presumption that firms may benefit from network membership, but it is not always made entirely why this is so. However, Håkansson (1993) has recently pointed to collective learning as one possible source of competitive advantage for the network firm. There may, however, be other such network capabilities, that is to say, capabilities that emerge from the interaction of firms in networks, but is not fully reducible to the capabilities of individual firms.

In order to clarify the understanding of collective learning and of network capabilities in general, I suggest to take a brief look at the Marshallian tradition in industrial organization. This tradition has traditionally been characterized by a concern with many of the same issues that today occupy network researchers. For example, in terms

of the concern with *both* industrial stability and change that characterized Marshall's work, the Swedish network approach is very Marshallian, indeed.⁵

3.2. *The Marshallian tradition, network capabilities, and collective learning*

As Brian Loasby has keenly observed (Loasby, 1990, 119), Marshall conceptualized markets in a way that differs significantly from both standard neoclassical economics and transaction cost economics. To Marshall, "... markets are like firms. Both are structures for promoting the growth of knowledge and both require conscious organisation" (Loasby, 1990, 120). Of course, this does not mean that "markets" are designed in painstaking detail; it rather means that in Marshall's vision, markets are significantly less anonymous than they are in standard expositions of the price mechanism.

While the individual firm may have superior knowledge about, say, the production of a particular component, it does not have superior knowledge about the whole of the production process into which its component enters. To strike a Hayekian chord (Hayek, 1945), it is likely that nobody will in fact possess the whole of this knowledge; it is dispersed throughout the industry/network, residing in the whole package of firm and network capabilities. Of course, this does not mean that the industry/network does not "know" how to produce. To paraphrase Hayek with a bow to Richardson (1972), the marvel is precisely that competition *and cooperation* ensure that effective use is made of capabilities that are not possessed by any single firm in their entirety.

Of course, firms are never completely self-contained. As Richardson (1972, 885), Marshall's most prominent contemporary heir, pointed out, effective cooperation will normally require some knowledge of "neighboring" capabilities (those possessed by other firms), so that "... their limited individual fields of vision sufficiently overlap so that ... the relevant information is communicated" (Hayek, 1945, 86). This "overlap" is precisely brought about by cooperative relations between firms that wish to gain access to the "complementary" but "dissimilar" capabilities of other firms (Richardson, 1972).

In this Marshallian tradition the interaction between competing and cooperating firms is placed center-stage. One of the reasons is that this interaction yields a number of *systemic effects* that is easily neglected if one adopts the standard economic perspective of anonymous market transactions. It is these systemic effects, I refer to with the concept of network capabilities. One such important systemic effect is "*collective learning*", that is to say, interactive learning over several actors (Håkansson, 1993, 215). Here is how Marshall described his specific example of firm interaction and the collective learning it may yield, the "industrial district":

"The mysteries of the trade become no mysteries; but are as it were in the air ... inventions and improvements in machinery, in processes and the general

⁵In fact, the connection to Marshall's work has often been mentioned, but seldom analyzed.

organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. And presently subsidiary trades grow up in the neighborhood, supplying it with implements and materials” (1925; 225).⁶

As can be inferred from these sentences, Marshall’s industrial district has more to it than costs falling as a function of the total production of the district as “subsidiary” but specialized, and hence cost-efficient, “trades grow up in the neighborhood”. Clearly, such pecuniary external economies are important; but equally important is Marshall’s view of “the market” as a decentralized but nevertheless effective learning system; an efficient governance mechanism for collective learning, as it were. Interaction, communication, personal ties, and more or less intended sharing of knowledge between independent firms bring both stability and variety. Stability, because personal ties, norms, etc. create a constraining framework; variety, because the spread of knowledge may fuel the process of technological change.

Håkansson (1993, 217) notes that within the network approach, “... we are looking for a collective business structure where stability and variety can be combined”, since these two conditions are both crucial for fostering collective learning. In fact, Marshall’s industrial district is one such structure. And his broader evolutionary vision clearly dovetails with Håkansson’s emphasis on both stability and variety as promoting the growth of commercially valuable knowledge.⁷ In this sense, much of the Swedish network approach is genuinely Marshallian, although this is probably largely unrecognized by network researchers.

3.3. *Marshall and the network approach: A capabilities view of the industry*

At any rate, underlying both the Marshallian vision and the network approach is a picture of “the market” or “the industry” as much more than a collection of self-sufficient firms. That is to say, the industry/the network is more than the sum of the capabilities of firms. Essentially, this is because of the existence of a number of distinct network capabilities, tying together and interacting with the capabilities of individual firms. As Marshall saw it, the decentralized industrial district embedded in network capabilities was an engine of innovation. Contrary to Chandler and Lazonick, the market form of organization *is* in fact sometimes able to learn and generate new capabilities in a self-reinforcing and synergistic way.

⁶Compare Saxonian’s (1991, 410) modern description: “Silicon Valley today is far more than an agglomeration of individual technology firms. Its networks of independent yet autonomous producers are increasingly organized to grow and innovate reciprocally. These networks promote net product development by encouraging specialization. They spur the diffusion of new technologies by facilitating information exchange and joint problem solving between firms”.

⁷I have here in mind Marshall’s “general rule” that both “differentiation” (in terms of “subdivisions of functions”) and “integration” (“a growing intimacy and firmness of the connections between the separate part of the industrial organism”) are increasing with the development of any “organism, whether social or physical” (Marshall, 1925, 241). On Marshall and evolutionary economics, see Foss (1994b).

In Marshall's evolutionary conception of market activity, it was variation that drove competition and particularly the process of technological competition. However, variety is more prevalent in a decentralized network of firms than it is in the large corporation. And to the extent that learning is a matter of trial-and-error, the production of new knowledge is much better fostered by the clash of independent conjectures relating to new resource-uses, than by having everybody conform to the same conjecture (as in the large, vertically integrated corporation) (Loasby, 1990).

In fact, such dynamic knowledge externalities were the ones that interested Marshall the most. But there are many other relevant externalities and capabilities. To have access to efficient factor markets at relatively low transport costs, to benefit from migrations among firms of engineers (Silicon Valley style), to be able to tap into a pool of skilled labor, to share in standardization, to benefit from the general presence of trust relations, etc. — all these represent or are closely related to what I here call network capabilities. They are potentially beneficial factors that are not (completely) internal to the individual firm but (also) lie outside its boundaries.

The analysis of these network capabilities has not been much assisted by either standard neoclassical economics or transaction cost economics, perhaps particularly because of the standard assumption that "in the beginning there were markets" (Williamson, 1985, 84).⁸ Of course, we may dress collective learning and network capabilities up with some standard economic terminology. For example, they clearly are positive externalities to firms. Furthermore, we do not fully understand how network capabilities may contribute to the competitive advantage of firms. This problem has not been satisfactorily addressed within the Swedish network tradition. In the following sections, I suggest to take some preliminary steps toward a more satisfactory analysis of network capabilities. In order to do this, I shall draw on the resource-based approach to strategy.

4. A resource-based analysis of network capabilities

The resource-based perspective starts out from a view of the firm that is quite akin to Penrose, Richardson, Chandler or Lazonick's view of the firm. Thus, the firm is seen as a bundle of heterogenous and rent-earning resources and capabilities.⁹

⁸Which completely side-steps that we do in fact not have a satisfactory theory of markets. What we have in a theory of exchange, and that is something that takes place within markets; to confuse them is a category mistake (Loasby, 1993). But in order to understand how firms emerge from markets, we should surely start out from a satisfactory theory of markets; which we do not.

⁹It should be noted that the literature has not yet settled on an accepted way to distinguish between resources and capabilities. My own suggestion is that while resources are always tradeable, capabilities are not directly (see also Foss and Eriksen, 1994). For example, there is no direct market for capabilities such as reputations, core competencies and organizational cultures. Furthermore, capabilities are not tied to individual agents, while resources often are. The services an opera singer's human capital yield are in this perspective resources, while IBM's culture is a capability. I stick to this terminology in this paper.

Different bundles of resources and capabilities are associated with different levels of efficiency in serving customer wishes; hence, some bundles yield economic (Ricardian) rent, whereas other bundles just allow firms to breakeven. This is largely consistent with the above writers on firm capabilities. Where the resource-based approach differs from their work is in laying bare the conditions for resources and capabilities to earn long-lived rent-streams, that is to say, for firms to acquire sustainable competitive advantage (more on these conditions later).

Although the logic of the resource-based approach emphasizes asymmetries among individual firms, there is nothing inherent in it that excludes that it be applied to collectivities — such as networks — of firms, so that it becomes meaningful to say that one collectivity of firms *as a collectivity* has a competitive advantage relative to other such collectives. In other words, I suggest that the resource-based perspective may usefully be applied to the analysis of network capabilities. This will cast some light over the benefits that firms participating in networks may achieve relative to firms from other networks. In the following I present an analysis along these lines. I first look at the processes that may lead to the emergence of network capabilities; then examine why network capabilities may support the competitive advantage of network firms.

4.1. The emergence of network capabilities

Like firm capabilities, network capabilities are accumulated (and not acquired on factor markets); something which Marshall (1925) clearly understood (Loasby, 1993). However, markets, industrial districts, networks, etc., and their embodiments of network capabilities are themselves goods; indeed, to some extent they are public goods (namely to incumbents). This raises the usual problem associated with public goods: if all firms in the network benefit from the presence of, for example, collective learning, they all have an incentive not to contribute to the accumulation of this asset. In other words, how do network capabilities come into existence?

Our understanding of this important issue has not been assisted by transaction cost economics, which assumes that “in the beginning, there were markets” (Williamson, 1985, 84). Again, however, the answer may be found in Marshall. To Marshall, firms must create not only internal but also external organizations. Building an external organization is a matter of building a reputation, developing mutual understanding between one’s trade partners, and undertaking marketing efforts in general. In other words, it involves asset accumulation; it is therefore time-consuming and costly.

Firms that expect many future dealings will have an incentive to undertake these accumulation efforts. The emergence of market-making firms solves the public good problem. And the efforts of many interacting firms result over time and in a more or less unintended way in the structures known as “networks”, etc., including their systems of capabilities. It is important to emphasize that it takes time for an aspiring network of firms to accumulate stocks of network capabilities. Interfirm relations are not given, but develop; knowledge-sharing, trust relations, standardization, etc. must be built up or allowed to gradually emerge — all processes that involve long and protracted efforts, false starts and later corrections, etc.

4.2. Network capabilities as sources of competitive advantage

The stocks of network capabilities that firms in a given network may have access to may give them competitive advantage vis-à-vis firms from other networks.¹⁰ And as I shall argue, it is the characteristics of the asset-accumulation process which may underline the sustainability of this competitive advantage. Intuitively, this perspective is pertinent to the analysis of international, regional or national competition. Clearly, firms that, for example, share in extensive but geographically bounded learning, etc. may benefit in international competition from these network capabilities.

The conditions for network capabilities to give rise to sustained competitive advantage are essentially the same as in the case of firm capabilities, which has been extensively treated in the resource-based literature (Barney, 1986; Dierickx and Cool, 1989; Peteraf, 1993). The difference is of course that we have to think of the entity possessing the valuable as a collectivity of firms instead of a single firm, although the individual firm may derive advantage from it. Let us here take a look at the standard resource-based conditions for obtaining and sustaining competitive advantage, and apply these conditions to network capabilities. Resources and capabilities may yield rent if they are.

1. *valuable*. This means that the relevant resources and capabilities allow the firm to exploit opportunities and/or neutralize threats in its environment. Since network capabilities include, for example, beneficial collective learning that may speed up the accumulation of R&D assets and the rate of new product introduction (Saxonian, 1991), they may clearly be valuable to firms that share in them. For example, the asset accumulation processes of individual Silicon Valley firms are eased by the presence of technological collective learning. A firm such as Sun Microsystems draws heavily upon the results of the collective technological learning in Silicon Valley, and this helps the firm to be at the forefront of the technological evolution in high end workstations (Saxonian, 1991).

2. *rare*. It almost goes without saying that network capabilities will usually be rare, in the sense that very seldom different firm networks will possess the same network capabilities. Of course, firms may try to reduce this rarity; as when Japanese firms invest in Silicon Valley firms, because they wish to gain access to Silicon Valley network capabilities (Teece, 1992).

3. *imperfectly imitable*. Even if resources and capabilities are valuable and rare, they may not give rise to sustained competitive advantage if they can be imitated. Much research within the resource-based perspective has focused on the factors that may make resources and capabilities inimitable or partly inimitable. As Lippman and Rumelt (1982) argued, the primary reason why resources and capabilities should be inimitable has to do with the link between them and the competitive advantage they

¹⁰This kind of externality-induced competitive advantage is conceptually completely identical to, for example, the competitive advantage a ski-shop may obtain simply from being closely located to a popular ski-resort. For an application of this reasoning to the issue of the competitive advantage of regions, see Foss (1994a).

give rise to being “causally ambiguous”. Clearly, collective learning may be a largely inimitable network capability, due to the intangible aspects of knowledge sharing or due to the presence of causal ambiguity.¹¹ Network capabilities in general may be imperfectly imitable because of their social complexity (i.e., they arise from the interaction among potentially many firms) and possibly also because of tacitness (for example, behavioral norms may have a large tacit component).

4. *non-substitutable*. It should be possible for a competitor firm to accumulate a different set of resources and capabilities that can produce the product at a lower price or a higher quality. Obviously, this condition brings the innovation issue in focus. What is required is the absence of significant competitive process innovation. Clearly, network capabilities may for long periods of time be non substitutable; this is one of the factors that underlie the continued success of Silicon Valley firms, even in the face of repeated past attempts at substitution (Saxonian, 1991).

5. *imperfect competition in acquisition has to obtain*. Barney (1986) argued that if factor markets are perfect, resources traded on such markets cannot be sources of competitive advantage. This is simply because of perfect markets, the price of a resource will fully reflect its future contribution to value. So for resources to give rise to sustained competitive advantage, they have to be acquired on imperfect factor markets. Clearly, network capabilities normally cannot be purchased on any factor markets. The network capability of the personal ties and networking associated with, for example, London’s City, or the superior collective learning of Silicon Valley cannot be *purchased*; at most it can be (slowly) *built*.¹² Firm capabilities, on the other hand, may (indirectly) be acquired by foreign firms on the (international) market for corporate control.

Furthermore, due to their tacit and complex nature, network capabilities are largely immobile in the sense that they cannot easily be transferred, copied, reverse-engineered, etc. This stickiness is an important reason why network capabilities may cause dispersal of the rents that accrue to firms in different regions. However, in spite of this stickiness, and therefore imperfect competition in acquisition, there may be competition in development. This means that although network capabilities cannot be transferred from one geographical region or network to another, and cannot be acquired on factor markets, conceptually clusters of would-be imitator firms could try to accumulate similar stocks.

6. *imperfect competition in development has to obtain*. As Dierickx and Cool (1989) argued, many resources or, rather, capabilities are not acquired on strategic factor markets. Capabilities such as superior production knowledge or a strong corporate

¹¹The post-war success of the Japanese industrial system may have something to do with causal ambiguity confronting would-be imitators: theorists have identified the subsidizing and coordinating efforts of the MITI, have singled out Japanese culture, the particular form of economic organization etc. — without settling on any agreed causal link between these resources and capabilities and Japanese success. The causal ambiguity, in turn, may be caused by tacit elements and by the extreme complexity in the relevant causal connections.

¹²Of course, public authorities often try to “plan external economies”, as in so-called “science parks”.

culture are rather developed internally. However, there may be competition in development of such capabilities among firms. For example, firms may all try to develop a superior reputation. This will in the limit drive up investment costs so much that there will be no advantage from the relevant capability. This argument may also be extended to the case of network capabilities.

As Dierickx and Cool (1989) argued, given imperfect factor markets (see point 4, above), imitability of asset stocks hinges on:

6A. *Time compression diseconomies*. This expresses the phenomenon of diminishing returns when time is held constant. For example, students may not accumulate the same stock of knowledge in a one-year program as in a two-year program. Because of time compression diseconomies, firms may keep a lead relative to would-be imitators. Since collective learning effects speed up, for example, the process of technological change, incumbents may enjoy *time compression economies* relative to would-be imitators from networks.

6B. *Asset mass efficiencies*. One interpretation of this is the notion of “success breeds success”. What it means analytically is that sustainability will be enhanced to the extent that adding increments to an asset stock is facilitated by possessing high levels of that stock. For example, having a large stock of R&D stocks may facilitate further breakthroughs. In the same way that asset-mass efficiencies may give a, say, research-intensive firm a continuous lead, so may the asset-mass efficiencies of the combined, say, R&D efforts of network firms give the network a competitive lead as a whole. This is because collective learning implies that firms’ “absorptive capacity” (Cohen and Levinthal, 1990), that is, their ability to evaluate and implement the results of new outside R&D, is continuously kept at a high level. This makes it more easy to add increments to each firm’s stock of R&D assets (Saxonian, 1991).

6C. *Interconnectedness of asset stocks*. This means that accumulating increments in an existing stock may depend not just on the level of that stock, but also on the level of other stocks. For example, developing R&D asset stocks may be facilitated by having a large stock of contacts with advanced users. In the context of network capabilities, accumulating the valuable asset of collective learning may be strongly facilitated by the prior possession of stocks of trust relations in the relevant network. This means that the accumulation process of two different stocks feed on each other in a self-reinforcing way.

6D. *Causal ambiguity*. As already stated, this means that would be imitators confront ambiguity relative to the causal connection between a given asset stock and the competitive advantage this stock yields when positioned in a product market. Causal ambiguity may be even more pronounced in the case of network capabilities than in the case of firm capabilities, simply because the complexity is greater; there are many more potentially causally efficacious factors at work.

4.3. Strategic implications

The upshot of all this is that the analytical categories developed within the resource-based perspective for the analysis of the sources of competitive advantage of individual firms may be usefully applied to the analysis of network capabilities.

Resource-based analysis helps us better understand under which circumstances such network capabilities as collective learning may contribute to the sustained competitive advantage of network firms. It is doubtful whether this resource-based analysis significantly changes some of the more strategically oriented conclusions that have been drawn within the network approach. For example, the basic strategic implications discussed in Håkansson (1987, Ch. 6) are not substantially altered.

These implications refer to the importance of (1) getting involved (for example, by interaction with already established actors and paying the requisite "entrance fees"), (2) of having power of endurance, (3) having both strong and weak ties (that is, both relatively loose information channels and close relationships), and (4) of being able to defend and change positions (both in terms of relations and in terms of competitive advantage). I have analyzed network capabilities, particularly collective learning, as a distinct rent-yielding asset for network firms. All the above strategic implications do not stand in contrast to this analysis, but rather complements it. For example, the strategic implication of getting involved points to the fact that rent-yielding network capabilities may attract entry into the network. At the same, it is individual firms' pursuit of these strategies that *create* network capabilities (for example, by establishing ties, by changing positions etc.).

5. Conclusion

In this paper, I have put forward a number of conceptual suggestions that relate to the network approach associated with a number of Swedish researchers on the one hand. One of the points I have made is doctrinal: there is a number of affinities between network theory and the Marshallian tradition in industrial economics. This better allows us to understand the economics of networks. To the extent that network theorists wish to draw inspiration from economic theory, they would be as well off by drawing this inspiration from the writings of Marshall, Richardson, Loasby and Langlois, as from the transaction cost economics of Oliver Williamson. Clearly, transaction costs play an extremely important role; but as it stands currently, transaction cost economics has very little to say on dynamic issues that relate to the accumulation of resources and capabilities. As a result, it is not suited to addressing the issue of networks as mechanisms for developing resources. This is much more satisfactorily addressed within the Marshallian tradition.

What this tradition does not, however, address is the sources of competitive advantage of the network firm. Here, I have suggested that we may apply the analytic categories developed within the recent resource-based perspective in strategic management to the analysis of network capabilities. Briefly, firms may benefit (*vis-à-vis* firms that are not part of their network) from network capabilities, such as collective learning, when these capabilities are valuable, rare, inimitable, nonsubstitutable and characterized by imperfect competition in acquisition/development. Furthermore, competitive advantage may be sustained by a number of interaction effects between firms' capabilities and network capabilities. This analysis of network capabilities as sources of competitive advantage to network firms does not change, but rather

complements, the strategic prescriptions that have traditionally been put forward within network research.

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