Barter in Networks: 
A Revived Form of Inter-Firm Exchange

Stephan Schrader

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Summary

Firms frequently enter network type relationships such as strategic alliances and partnerships to barter difficult-to-price goods like technical know-how, market understanding, and management practices. The paper proposes that barter of difficult-to-price goods is easier to realize than a money-based exchange — as long as the double coincidence of wants is given. Under such circumstances, barter requires decisions of less cognitive complexity than are necessary in the context of a money-based exchange system. Networks support barter through allowing temporal separation of transactions, facilitating identification of transaction possibilities, and establishing mechanisms to enforce cooperative behavior. The barter-supporting role of networks complements other explanations for the existence of networks, especially the ones derived from a transaction cost framework.

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Introduction

Inter-firm networks have received considerable attention in recent years. Popular business publications proclaim that the formation of networks constitutes an integral part of a successful business strategy (e.g. Economist, 1990). Numerous academic articles attempt to conceptualize core issues of inter-firm networking (e.g. Barley & Freeman, 1990; Furukawa, Teramoto, & Kanda, 1990; Gemünden, 1990; Håkansson, 1987; Jarillo, 1988; Luke, Begun, & Pointer, 1989; MacMillan & Farmer, 1979; Ouchi & Bolton, 1988; Porter, 1990; Saxenian, 1989; Thorelli, 1986). This paper investigates a characteristic of networks that has been widely neglected by the literature: the support of barter as a mode of exchange.

Networks provide the frame for a multitude of transactions, many of those involving barter. Firms engage in strategic alliances or partnerships to barter, for example, technical know-how for management experience or market understanding for technology (Hamel, Doz, & Prahalad, 1989; Leadbeater, 1990; Roberts, 1980). Several authors have described informal inter-firm networks in which goods such as technical information are not traded for money but bartered for other like goods — even if the goods are of considerable economic value (Rogers, 1982; Schrader, 1991, von Hippel, 1987).

In this paper, I propose that situations exist in which a barter system offers distinct advantages over a trade-for-money system. These advantages exist especially if it is difficult to put a monetary value on the goods to be exchanged, as is frequently the case for goods like information or market access. Under such circumstances, networks help to establish barter systems and to capture the benefits of such systems.

To characterize situations prone to barter, I introduce a distinction between the ability to specify the attributes of a good and the ability to price the good in
monetary terms. Most authors discuss only one of these dimensions (e.g. Williamson, 1975) or view them as closely linked (e.g. Arrow, 1971). Based on this distinction, four unique transaction modes are characterized: discrete purchase and discrete barter as well as relational purchase and relational barter. I argue that networks support both relational barter and discrete barter through allowing temporal separation of transactions, facilitating identification of transaction possibilities, and establishing mechanisms to enforce cooperative behavior. This characteristic of networks augments the traditional transaction cost and communication oriented explanations for the existence of networks. Furthermore, the argument that barter is the preferred transaction mode if prices are difficult or impossible to determine implies that those conventional control and decision practices relying on prices and related quantitative measures are likely to fail in barter-supporting networks. This conclusion has considerable management ramifications and should encourage the study of how to govern such situations.

The paper consists of four parts. First, I review briefly some of the relevant literature on inter-firm networks. Next, I introduce a framework to distinguish barter from trade-for-money. Then, I discuss why barter appears to be the preferred mode of exchange in some settings. Finally, I investigate how networks support the emergence of barter systems.

**Networks as Governance Structures for Inter-Firm Relationships**

Firms face several alternatives for organizing their vertical and horizontal relationships. The two ideal types discussed by Coase (1937) and Williamson (1975) are markets and hierarchies. In market relationships, transactions take place between independent entities and are mediated by a price mechanism. In hierarchical relationships, the transaction partners are part of one corporate body
which somehow mediates the relationship through such mechanisms as surveillance, evaluation, and direction.

The market-hierarchy typology has served several authors as a starting point for more refined typologies. Ouchi (1980), for example, discusses three types: markets, bureaucracies, and clans. The latter is characterized by a considerable correspondence of organizational and individual goals.

Jarillo (1988) extends this typology by differentiating markets further into classic markets and strategic networks. Classic markets are characterized by a competitive relationship between transaction partners. Not so in strategic networks. Strategic networks are based on a potential for cooperation. The possibility of capturing long-term benefits from cooperative behavior induces firms to overcome short-sighted opportunism and to enter long-term relationships while maintaining most of their organizational independence.

MacNeil (1978) differentiates market contracts even further. He introduces three types of contracts: classical contracts (the identity of the transaction partner is irrelevant and each party's obligation is well-defined), neoclassical contracts (mostly long term contracts that provide governance structures for solving potential conflicts instead of explicitly anticipating every contingency), and relational contracts (agreements on governance structures for entire long-term relationships that may evolve well beyond the originally planned transactions).

This paper adopts Thorelli's definition of networks as "two or more organizations involved in long-term relationships" (Thorelli, 1986, p. 37), and thereby includes both neoclassical and relational contracts. These relationships can be of contractual as well as non-contractual nature. In most cases, a mixture of both will be present (Macaulay, 1963). The definition used is sufficiently open to encompass several forms of inter-firm relationship, ranging from explicitly organized networks such as supply networks (Jarillo, 1988) to implicitly evolved
networks such as informal information trading networks between competitors (von Hippel, 1987; Schrader, 1991).

The literature discusses networks primarily in the context of vertical relationships. Note, however, that organizations frequently engage not only in vertical but also in horizontal networks. Research consortia with competing firms as members are a case in point (Dimancescu & Botkin, 1986). Firms participating in such consortia have developed formal horizontal ties to gain advantages from resource pooling and risk sharing. Informal information trading between competing firms is another example (Carter, 1989; Schrader, 1991; von Hippel, 1987). Firms within one industry are linked by informal communication networks. Employees exchange information in these networks without explicit contracts.

Why do networks exist? The conventional explanation as provided, for example, by MacMillan and Farmer (1979) argues that networks capture core benefits of markets while enjoying some transaction costs advantages of hierarchies. First, networks enable firms to realize economies of scale and specialization advantages (Jarillo, 1988). One network member may specialize on the production of a specific good and distribute the good to the other members. Thus, the network partners benefit from the organizational advantages of small specialized firms. Risk is spread between different entities. And the market test is still applicable. If better trading terms can be obtained elsewhere in the long run, no permanent tie (as in the case of vertical integration) stops either party from forming new relationships outside the existing network (MacMillan & Farmer, 1979, p. 283). Jarillo (1988, p. 35) concludes: “Networking introduces a cost discipline that may be absent in an integrated firm, with its captive internal markets.” Also, in times of considerable technical change, networks allow a less expensive restructuring of a firm’s ties to specific technologies than would be possible in the context of hierarchies (DeBresson & Amesse, forthcoming). Second, networks capture benefits of hierarchies. Networks help to
avoid some of the transaction costs that emerge in a pure market system due to opportunistic behavior and asset specificity (Jarillo, 1988; Joskow, 1987; Klein, Crawford, & Alchian, 1978; Thorelli, 1986; Williamson, 1985). Klein, Crawford and Alchian (1978), for example, demonstrate the negotiation problems that arise in supply relationships if either of two contract partners has to invest in relationship-specific assets. Such problems can be mediated by networks. For this, the network partners have to expect that they will benefit from an ongoing cooperative relationship and that this benefit overcompensates any short-term gains that would result from opportunistic behavior (Jarillo, 1988). Consequently, network partners are willing to invest in network-specific assets even if this increases their dependency and thereby vulnerability to threats. They trust that other network members will not use this vulnerability to cause them undue harm.

In this paper, I propose that the conventional theory of networks should be augmented by another characteristic of networks. Networks support the emergence of barter systems. I argue that this is an important characteristic of networks since some goods can be bartered more effectively than they can be traded for money. Before this argument can be explored further, however, the concept of barter needs clarification.

**Barter**

Barter is a form of "reciprocal dealing" (Thorelli, 1986, p. 44) in which one good is exchanged for another good without using a separate unit of account or medium of exchange (Pearce, 1986, p. 36). These reciprocal dealings may occur simultaneously. For example, IBM gives Siemens access to (parts) of its chip production technology and at the same time Siemens provides IBM with access to its technical expertise (Markoff, 1990). Alternatively, a temporal separation of
transactions can occur (von Weizsäcker, 1985). Take information trading in the oil-exploration industry as an example. In this industry, employees have been observed to exchange well-logs informally (Schrader & von Hippel, forthcoming). In some instances, several months can pass between giving one well-log and receiving another well-log in return. The party that first provides a good to the other party acquires a claim to receive a comparable good in the future.

In the following, three types of barter are distinguished: discrete barter, relational barter, and pseudo barter. **Pseudo barter** refers to a transaction that at first sight appears to be barter but that can be readily decomposed into two good-for-money transactions. Bartering crude oil of a specific grade for an equally well-defined amount of wheat with both parties having the alternative of buying and selling the respective commodities on the world market is a case in point. Using world market prices, the barter can be broken up into two good-for-money transactions — including a side-payment if the respective amounts do not cancel out.\(^1\) Since pseudo-barter can be interpreted as a set of separate purchasing agreements, the term barter as used in the remainder of the paper will not include pseudo-barter.

**Discrete barter** refers to the exchange of one well-defined good for another well-defined good in a situation in which commonly accepted valuations are not readily available. Assuming self-interested actors, such barter occurs if the post barter distribution of goods is preferred to the pre barter one. Yet, the parties need not to be able or willing to agree on precise monetary prices for the goods. Even if each party would be capable of valuing the goods in exact monetary terms, the valuations do not necessarily have to be such that they determine a non-empty negotiation space. Barter necessitates only that ordinal rankings of goods are such

\(^{1}\) In this case, an "objective" valuation of the goods exists insofar as the price is determined in a way that is widely independent of the individual market participants' preferences (Weizsäcker, 1985).
that an exchange is preferable, not that cardinal evaluations would justify an exchange.

In the case of discrete barter, it is not possible for a third party to deduce without additional information the parties' valuations of the goods exchanged. What can be determined is that \(x\) units of one good have been exchanged for \(y\) units of another good. This relation, however, only conveys the information that the parties have reached a specific agreement. It does not convey any further information on the valuation of the goods. It is not possible to conclude for how many units of a third good the parties would have exchanged the goods in question.

Von Weizsäcker (1985) argues convincingly that barter systems break down as soon as the parties evaluate specific transactions monetarily. If such valuations occur, the parties will perceive, at least temporarily, inequalities and will require to be compensated by side-payments. The resulting negotiations will lead to an introduction of money-based exchange systems. He proposes that valuation is either required in an exchange relation (money-based exchange) or that it is explicitly or implicitly forbidden (barter).

Relational barter\(^1\) differs from discrete barter by the transaction content not being well defined are well definable. Technical know-how, for example, frequently falls into this category. Know-how can be tacit, ill-understood, and embedded in a complex set of subjective knowledge (Polanyi, 1958). If such know-how is to be exchanged, any attempt to precisely stipulate the content of the exchange is doomed to fail. Consequently, other (explicit or implicit) contractual mechanisms have to be employed. Relational contracting (MacNeil, 1978; MacNeil, 1980) provides an alternative. Here it is not the substance of the exchange that is determined, but rather procedural aspects and relationship characteristics. Examples of procedural

\(^1\) The notion of relational barter is closely linked to MacNeil's (1980) concept of relational contracts.
regulations are control meetings, documentation requirements, and reporting obligations. Sometimes these procedures are never agreed on explicitly but evolve out of an ongoing relationship. An extreme case of relational barter is academic collaboration. In such collaborations, it is frequently impossible to identify or to monetarily value individual transactions (what is a transaction in the context of an academic discourse?). Nevertheless, the partners may have well-formed perceptions of whether the cooperation is beneficial to each of them and of whether the exchange should be continued in the future.

Figure 1: Types of Barter

Figure 1 summarizes the proposed distinction between discrete barter and relational barter. Both are characterized by the parties not having to agree on a precise monetary price for each barter component. A decomposition of the barter into several good-for-money transactions cannot be done without strong assumptions, and — as von Weizsäcker argues — probably is not done by the parties even if it would be possible. This characteristic distinguishes barter from money-based exchange. In money-based exchange, the parties involved agree on precise prices. Frequently, such agreement is achieved by adopting established market
prices. Under other circumstances, prices result from negotiations. This requires each party to generate at least a rough monetary valuation of the good in question and that the parties are able to agree on a specific monetary value (the price) that fits with the valuations by all parties.

Two types of money-based exchanges can be distinguished, again using the ability to specify the attributes of the goods to be transferred as classification criterion. The two types are discrete purchase and relational purchase. **Discrete purchase** refers to an exchange in which the good can be determined precisely. This is the classical purchasing agreement as it is considered by traditional microeconomic theory. **Relational purchase** provides a more interesting case. In a relational purchase, the parties agree on a price for the goods to be exchanged, but fail to precisely specify the substance of the exchange. Consulting contracts are a case in point. Frequently, well established hourly rates exist and the parties can refer back to those rates when determining the exchange price. Yet, the substance of the consulting work cannot be agreed on in detail before the transaction — otherwise the consulting work would be superfluous. Therefore, a relational contract is established, using means such as reputation, control procedures, and iterative interactions to ensure that both parties are satisfied with the outcome of the exchange.

In conclusion, the two dimensions discussed — ability to specify attributes of the goods to be transferred and ability to determine prices — can be used to distinguish four types of exchange relationships that should be preferred under different circumstances, as shown in Figure 2. Whether or not the transaction partners are able to specify ex ante the attributes of the goods to be exchanged determines whether or not they will utilize substantive contracts or relational contracts. Their ability to determine prices impacts their inclination to trade the goods for money or to barter them.
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<th>Ability to determine price of good to be exchanged</th>
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<td>High</td>
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<td>Discrete purchase</td>
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<td>Low</td>
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<td>Money based exchange</td>
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<td>Substantive contract</td>
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**Figure 2: Classification of Exchange Relationships**

In the following sections, barter is investigated further. First, examples of barter in networks are provided; then advantages of barter are discussed; and finally the support of barter through networks is examined.

**Characterization of Barter in Networks**

Network transactions frequently show characteristics of barter, i.e. occur without direct monetary compensation. Engineers, for example, exchange information about how to solve specific technical problems through professional networks with colleagues in other firms (von Hippel, 1987; Schrader, 1991). A large German bank provided a competing bank with access to its central computer facility when the other bank’s computer facility was not operational for several days due to a power failure (Kieler Nachrichten, 1978). U.S. minimill steel companies frequently exchange metal dies in situations of unexpected need. Motorola provides Toshiba with access to its microprocessor technology in return for Toshiba’s support in penetrating the Japanese semiconductor market (Hamel et al., 1989).
Valuable goods — information, access to computer facilities, metal dies, technology and market access — are exchanged within networks without a compensating flow of money. These exchanges are part of a barter system. The goods are provided in the expectation of receiving other valuable goods in return. The bank that opened its computer facilities to a competitor thereby gained the right to use the other firms facilities in a similar situation. In other words, the bank bartered access to its facilities for some type of insurance against a breakdown of its own computer system.¹

One type of good that is frequently bartered in networks is information. A leading user of printed circuit boards (PCBs) and its suppliers shall serve as an example. The PCB user decided to change its relationships to its suppliers. The motto was “We are a world class manufacturer, we want to be a world class customer.” The number of suppliers was greatly reduced to be able to develop a close network with the remaining ones. A system of long-term supply contracts was established. In addition, the companies bartered valuable, proprietary technical information. Each firm was contributing some of its knowledge regarding design, production, and testing and was receiving similar knowledge and other difficult to price goods such as greater supplier reliability in return.

Barter of information in networks can also be observed between rival firms (von Hippel, 1987; Schrader, 1991). In some instances, the horizontal exchange of information is supported by other organizations that are placed in the vertical chain before or after the horizontal network. For example, some equipment suppliers encourage their customers to exchange technical information between each other in so-called user groups. Similarly, manufacturers frequently induce information trading between their suppliers. Concast’s management of its customer’s relations

¹ In addition, the bank might have been motivated to help in order to prevent a negative image spillover.
demonstrates the vertical support of horizontal information exchange networks. Concast is a leading supplier of continuous casters, a crucial piece of equipment for steel minimills and nowadays for other steel companies as well. In the early years of the industry, Concast required its customers to feed information about equipment modifications back to Concast. Concast in turn communicated this information to other customers. This system can be interpreted as an indirect barter system. Each equipment user contributes technical expertise to the network and gains access to other users' expertise. The system, however, started to break down when the user community evolved and the level of technical sophistication started to vary strongly between firms, leading to a perceived inequality of the exchange.

**Advantages of Barter**

The observation that many goods are bartered in networks and are not exchanged for monetary compensation is puzzling at first sight. Traditionally, economists have assumed barter to be an inferior mode of exchange in comparison to trade-for-money. A frequently cited argument in support of the supremacy of money-based exchange is that barter requires finding a partner that wants what one has and that has what one wants, the so called double coincidence of wants (Pearce, 1986; Samuelson, 1985). A trade-for-money system, however, allows decomposition of one barter transaction into two transactions that may occur with different partners. No double coincidence of wants is necessary. This, so the argument goes, reduces transaction frictions in comparison with a barter system. In the following, however, I argue that not all advantages fall on the side of the trade-for-money system. The barter system has some distinct advantages as well, especially that the complexity of trading decisions is frequently reduced through barter. Three advantages are discussed next.
(1) Barter decisions are of less complexity than corresponding trade-for-money
decisions. A money-based exchange of two goods frequently requires considerable
sophistication due to the transaction partners having to agree on a specific monetary
valuation as transaction price. This might be simple for goods with well established
market prices, but, it can be difficult for unique goods, especially for information.
Arrow (1971) argues that in many cases the value of a specific unit of information
cannot be estimated without knowing the information. But once the information is
known, no further need for acquiring it exists.

Barter does not require a quantification of value. Barter requires only that the
transaction partners are able to order potential outcomes (i.e. trade or no trade)
according to their preferences. To establish ordinal rankings is less cumbersome
than to establish cardinal evaluations. This shall be exemplified using a simple case
in which substantive contracting is possible. Assume one printed circuit board
manufacturer A has developed a new technology for soldering components to
circuit boards. And, assume another manufacturer B has improved existing testing
technology considerably. Both firms would benefit from the other firm’s
technology. In a trade-for-money system the sale of the two technologies would not
be linked. Each technology is considered separately. For the decision whether to sell
A’s technology to B, A has to determine its minimum selling price and B has to
determine its maximum buying price. Subsequently both parties have to negotiate
the final price for the transaction. A similar set of decisions has to be made when B
considers selling its technology.

Now assume both firms consider whether or not to barter their technologies
and that no additional transaction possibility is considered at the same time.¹ In this

¹ This argument assumes that both parties have identified the possibility to barter. The difficulty
of identifying such possibilities creates one major obstacle to barter (Samuelson, 1985; Weizsäcker,
1985). In the next section it will be shown that networks support the identification of barter
possibilities.
case, the complexity of the trading decision is reduced to both A and B deciding whether or not they would be better offer swapping technologies. These are the only two decisions. The firms do not need to quantify the value they attribute to each alternative. They merely have to rank order the alternatives. If a firm can quantify the value of different alternatives, it naturally can rank order them as well. But this does not hold true the other way around. To be able to rank order two alternatives does not imply that the value of the alternatives can be quantified. Consequently, the decision whether to barter two goods is less complex than the decision whether to trade the goods for money.\(^1\)

**2** Likelihood of valuation conflicts is reduced. In contract negotiations, parties often quickly agree an exchange would be mutually beneficial, but fail to agree on the evaluation of the goods to be exchanged. This is especially a problem if the good possessed by one party is of little or no value without the good possessed by the other party. In this case, the marginal value of each good is at the same time zero and equal to the joint value, thus creating considerable negotiation problems. Such situations arise, for example, in joint ventures if both parties provide co-specialized assets (Teece, 1986). One party might provide market access and the other party technology, both goods being of little value without the other. In such a situation, agreeing on barter and avoiding the need to agree on valuations increases greatly the likelihood that the parties will engage in a mutually beneficial exchange. Conflicts over valuations are thus avoided (von Weizsäcker, 1985).

**3** Barter communicates less information about firms' valuations. In the course of price negations, each party conveys considerable information to its negotiation partner (Raiffa, 1982). To know the approximate price a competitor is

\(^1\) The more fine-grained the barter problem is framed, the more it approaches the complexity of the related trade-for-money decisions. If the smallest units to be bartered equal the smallest monetary units, and if the parties frame the barter decisions in these units, then both decisions are of comparable complexity. But frequently the units considered are not as fine-grained.
willing to pay for a specific technology can convey information about the
cOMPETITOR'S technology strategy and technical capabilities. Negotiations in a barter
system potentially convey less information. The transaction partners gain
intelligence of each other's ordinal rankings, but not of the absolute valuations of
different alternatives. Consequently, the less information a company wants to
convey in a negotiation process to another company, the more it might be inclined
to favor barter over trade-for-money.

In conclusion, a money-based exchange of difficult-to-price goods such as
market access or technical know-how confronts the firms involved in the exchange
with highly complex decision problems. Using a barter based mode of exchange
instead of a money based one reduces the complexity of these decisions considerably
(once the barter possibility is identified), thus decreasing the direct contracting costs
and increasing the chance of reaching a positive agreement. However, it can be
shown that abstracting from the difficulties to determine prices, a barter system can
lead to inefficiencies in the allocation of resources, especially if goods are non-
divisible. Yet, if the firm-specific value of the goods cannot be determined with
accuracy, then it is not meaningful to argue that barter is a less efficient allocation
mode than a money-based exchange; it might be the only one acceptable to the
decision makers involved.

How Networks Support Barter

One of the disadvantages of barter is that a "double coincidence of wants"
(Pearce, 1986, p. 36) is required for a successful transaction. Networks reduce the
severity of this disadvantage.

First, frequent interactions help network members to develop a good
understanding of potential contributions and needs of other members, thereby
increasing the likelihood of recognizing the possibility for a mutually beneficial exchange. In addition, institutions to support the identification of barter possibilities are frequently created. Such institution may be industry directories, regular meetings, and informal contacts. Oil-exploration firms, for example, employ individuals specifically to trade information informally (Schrader & von Hippel, forthcoming). These employees, the so called oil-scouts, are organized in professional associations and meet regularly, i.e. once a week. In these meetings, the oil-scouts report on the drilling activities that their firms undertook during the prior week without revealing the data gathered. In other words, the meetings help to identify trading possibilities. After the meeting, individual scouts might arrange on a one-to-one basis to barter specific data.

Second, networks provide an institutional setting to enforce commitments, generating the possibility for a temporal separation of the quid-pro-quo. In a network, two goods do not need to be bartered simultaneously. Rather, one party can provide the other party with a good while obliging the receiver to fulfill its part of the barter at an appropriate time in the future. Powerful mechanisms are available to enforce the fulfillment of such commitments. A non-cooperative member risks both the direct relationship to the party that is to receive the benefit, and its own reputation in the network (Axelrod, 1984; Hardin, 1982). Thus, not to honor commitments can lead to considerable network disadvantages (Jarillo, 1988). The resulting possibility for a temporal separation of contributions reduces the restricting effect of the double coincidence of wants. The exchange partners need not have matching wants at a given point in time. Barter is possible as long as they can expect that over time their (appropriately discounted) needs match.

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1 Bhide and Stevenson (1990) doubt that these mechanisms really work. They speculate that parties fulfill their obligations because they feel morally obliged to do so and not because of any economic rational.
Third, networks support not only discrete barter but are especially effective for relational barter. Networks can provide powerful frames for relational contracts by establishing procedures and norms for interaction (Aldrich, 1979; Tichy, 1981). Thus, the (explicit or implicit) barter contract can be limited to a few special concerns, thereby reducing transaction costs.

Fourth, tight-knit networks with high interdependence between its members frequently provide the possibility to turn one-to-one barter into a one-to-group barter, thereby eliminating the requirement for a double-coincidence of wants. In those networks, one member might provide another member with a good or service without expecting to receive a service back from that specific member. Through the provision, however, the member fulfills its network role thus legitimizing its membership. The membership provides the possibility of obtaining goods and services from other members — even if no dyadic trading relationship is formed. The network participants barter their contribution for the right to be a member of the network and to obtain membership benefits — created through contributions by other members (von Weizsäcker, 1985).

In sum, networks encourage the emergence of barter by providing a frame for identifying barter possibilities. They increase the chance of barter by allowing a temporal separation of contributions and by offering mechanisms for inducing cooperative behavior. They reduce the costs of barter contracts by having related procedures of interaction and relationship norms anchored in the network. Tight-knit networks may even eliminate the need for a double coincidence of wants. Without networks, barter is difficult to realize. The identification of potential barter partners with matching wants can be cumbersome (Samuelson, 1985). Temporal separation of transactions creates considerable contract enforcement problems. And possible difficulties of precisely identifying the substance of the barter provides a challenge to the contracting process.
The barter-supporting characteristic of networks helps to explain the recent emergence of networks for exchanging goods such as technology, market access, and management practices. All these goods are difficult-to-value and difficult-to-specify. The characteristics of such goods strongly favor relational barter as the interaction mode instead of traditional ones like purchasing agreements and simple licensing contracts. As shown, barter is difficult to establish if not supported by networks. Consequently, firms that want to exchange difficult-to-value goods are induced to establish inter-firm networks such as alliances, partnerships, and joint ventures to provide the framework supportive of barter.

**Mutual Reinforcement of Networks and Barter**

Two paths can lead from the identification of potential barter-possibilities to the establishment of barter-supporting networks. First, firms may consciously establish network-type relationships to establish a governance framework in support of barter transactions. This is a central motivation of many strategic alliances. Frequently, firms enter alliances after having identified areas of potential cooperation only vaguely hoping that once the network is established it will be less difficult to determine and realize specific barter possibilities. The alliance between Daimler Benz and Mitsubishi is a case in point (Sanger, 1990). When this alliance was set up in 1990, the firms merely agreed to cooperate, leaving to the individual business units the task of determining specific market skills and technologies to be exchanged. In cases like this, the establishment of networks drives the emergence of barter transactions.

Barter transactions, however, can also drive the establishment and stabilization of networks. Repeated interaction fosters trust (Axelrod, 1984), the formation of common interaction norms (Ullmann-Margalit, 1977), and the evolution of a shared
language (Hall, 1959), all of these supporting the establishment and stabilization of networks. In the very beginnings of the oil-exploration industry, firms exchanged on a one-to-one basis valuable geological and geophysical information, each exchange being independent of other interactions. Over time, the reoccurrence of such transactions led to the evolution of informal inter-firm networks. Later, these informal networks became institutionalized in the form of oil-scout-associations that provide a framework for the barter transactions.

Once networks are established successfully, they are self-reinforcing. They support the identification of further barter possibilities and, due to the repeated occurrence of like interactions, reduce the transaction costs of individual transactions. Consequently, the overall number of transactions is likely to increase. This, in turn, strengthens the networks even further. However, as Granovetter (1973) has shown for personal networks and as Glasmeier (forthcoming) has demonstrated for the Swiss watch industry, this continual reinforcement can under some circumstances actually be the cause for the long-term decline of the network. The network may become overly self-centered, unable to detect and access information that lies beyond its realm of expertise.

Figure 3 summarizes the discussed relationship between barter and the establishment of networks. It demonstrates the existence of different paths towards the establishment and/or stabilization of networks. And it shows that networks facilitate the identification and assist the realization of barter possibilities.
According to Figure 3, three distinct paths for the evolution of barter-supporting networks are discernable. The first path refers to networks created consciously to support the emergence of barter; barter transactions occur between the network members only after network creation. The second path relates to networks that evolved from a sequence of barter and other transactions. The third path describes a process in which networks were created for a different purpose, for example fostering investments into co-specialized assets, and then provided a framework supporting the identification and realization of barter possibilities. The distinction between different patterns for the genesis of barter-supporting networks is important, because each pattern poses distinct organizational and managerial challenges. The first path provides the challenge of inducing the network members to use the framework provided by the network. The second path demands that attention is paid to the institutionalization of interaction patterns. And the third path poses the problem of utilizing a network created for one purpose for another purpose.
Conclusion

This paper proposes that firms frequently use network-type relationships such as strategic alliances and partnerships to barter difficult-to-price goods like technical know-how, market understanding, and management practices. The paper argues that barter has some distinct advantages over a money-based exchange for such goods — as long as the double coincidence of wants is given. Under such circumstances, barter requires decisions of less cognitive complexity than are necessary in the context of a money-based exchange system. Networks support barter through allowing temporal separation of transactions, facilitating identification of transaction possibilities, and establishing mechanisms to enforce cooperative behavior.

The paper suggests that the inclusion of barter in a firm's mix of transaction modes increases the number of potential transactions. Some beneficial transaction opportunities may not be realized without considering barter. It is not argued, however, that barter is always the preferred transaction mode. In many situations, especially in situations in which "objective" and widely accepted valuations of goods are available, for example through market prices, a trade-for-money has considerable transaction advantages.

Network structures support the barter of such valuable and at the same time difficult-to-price goods as technology and other organizational skills. Many researchers have suggested that these goods are of increasing importance for the competitiveness of firms (Dertouzos, Lester, & Solow, 1989; Hayes & Wheelwright, 1984). Since, as argued above, these goods are frequently more easily bartered than traded for money, firms that are not set up to participate in barter transactions might be at a disadvantage to those firms that are. Networks provide a context within which organizations can enter cooperative trading relationships based on a mix
between trade-for-money and barter. Networks support the identification of barter possibilities and induce actors to forgo opportunistic behavior. They provide incentives to decide on interaction strategies not by evaluating one transaction at a time, but rather by considering the potential stream of transactions that may occur within the network. Thereby, cooperative behavior is encouraged.

The barter-supporting quality of networks augments the majority of the transaction-cost-based explanations for the existence of networks. In some cases, both barter and transaction costs explanations supplement each other. Some networks may fulfill several functions at the same time, encouraging barter transactions and, for example, allowing relationship specific investments. Other networks may be created only to support barter or only to overcome transaction problems of markets or hierarchies. This suggests that it is not enough to consider only one framework for understanding networks. Since networks may serve more than one purpose, more than one explanation is needed.

The proposition that barter is the preferred transaction mode if prices are difficult or impossible to determine implies that those conventional control and decision practices relying on prices and related quantitative measures are likely to fail in barter-supporting networks. In this case other, more process oriented control measures might be needed. This conclusion has considerable management ramifications and should encourage the study of how to govern such networks.
References


