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Towards a dynamic theory of transactions

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Abstract. Standard transaction cost economics (TCE) considers transactions from the perspective of static efficiency. Increasingly, attention is required to dynamic efficiency; to capabilities to exploit transaction relations for innovation. Since innovation is dependent on knowledge and learning, the step from the statics to the dynamics of exchange requires an understanding of the development and acquisition of knowledge, preferences, and meaning, and the role in that of interaction between transaction partners. As a step towards this, the article provides an exploration of theories of knowledge and knowledge development, the relation to language, the role of intersubjective relations, the connection with evolutionary theory and the implications for transaction cost theory.

Key words: Economic methodology – Information and uncertainty – Firm objectives, organization and behaviour – Technological change

JEL-classification: B4 – D8 – L2 – O3

Transaction cost economics

Transaction cost economics (TCE) was proposed originally by Coase (1937) to explain the existence of firms, and was further developed by Williamson (1975, 1985). According to Williamson's prior work, the user of some productive input has a stark choice to make between two "governance structures": integration of production of the input in the "hierarchy" of his own firm, or purchase in "the market" from an outside producer. The advantage of outside purchase ("outsourcing") lies in the "high powered incentives" of the market and in economy of

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scale, by which the input is produced more cheaply by a specialized producer supplying multiple users. There is a disadvantage due to transaction costs; particularly costs of dependency on an outside partner, which creates vulnerability of opportunism in so far as conditions are uncertain (during execution of the transaction). To the extent that investments are more "transaction specific", there is less scope for economy of scale in outside production, because the volume of production decreases to the volume needed by the focal user, and transaction costs of dependency increase.[1] At some point transaction costs exceed the benefits of outside production and in-house production is to be preferred (because under hierarchical control risks due to dependency are less). For transactions with an "intermediate" degree of transaction specificity of assets, Williamson later (1985) made allowance for two types of governance structure "between market and hierarchy". "Bilateral governance", with the institution of different kinds of safeguards to limit transaction costs, in the case of frequent, recurring and substantial transactions, which make the investment in such measures worth while. Examples of such safeguards are: ownership by the buyer of transaction specific productive assets; guarantees by the buyer, in the form of a guaranteed quantity and price of purchase or a severance payment; the supply of "hostages". Guarantees to the supplier require counter-safeguards to protect the buyer against misuse. For more incidental or smaller transactions, which do not warrant the cost of such measures, "trilateral governance" is proposed, with the appointment of a third party as an arbitrator to regulate any conflicts that may arise.

TCE is founded on two behavioral assumptions: bounded rationality and opportunism. It is due to the combination of these two conditions that transaction costs arise to the extent that assets are "transaction specific", whereby transaction partners become dependent on each other (are "locked in"). Bounded rationality is taken to arise from the scarcity or cost of information and limited capacity for information processing. If rationality were unbounded, all possible contingencies could be foreseen, even those arising from opportunism, and could be incorporated in a contract prior to commitment. If there were no opportunism, contracts could be left incomplete in the trust that unforeseen contingencies would be met in a spirit of cooperation and mutual benefit. In either case transaction costs would be low. Since in fact bounded rationality and opportunism both occur there will be transaction costs.

The limits of transaction cost economics

In traditional TCE, the causes of the existence of firms are sought in considerations of efficiency. Given a certain state of knowledge and technology and a preference ordering, efficiency is maximized by trading off production costs, transaction costs and costs of organization. The approach can be characterized as one of comparative statics, with a focus on static rather than dynamic efficiency. We define dynamic efficiency as efficiency in innovation, which is characterized by shifts of knowledge, technology and preference. Shifts of knowledge imply shifts of preference, since they may yield shifts of perception of outcomes of

[1] The relation between transaction specificity of products and productive assets is less close than standard TCE appears to assume, and this raises several complications. For a discussion, see Nooteboom (1990a).

opportunities or perception of new opportunities. Preferences may also shift due to a shift of evaluations of outcomes of opportunities or of corresponding risks. A shift of focus to dynamic efficiency would likely require substantial extensions or alterations of theory. This was granted by Williamson (1985, p. 143–144): "... the study of economic organisation in a regime of rapid innovation poses much more difficult issues than those addressed here" and "New hybrid forms of organisation may appear in response to such a condition ... Much more study of the relations between organisation and innovation is needed". Since at present business is striving under such a "regime of rapid innovation", further insight is of some importance.

In addition to theoretical considerations there are empirical arguments for extending or revising TCE. The evidence is that increasingly, different forms of organization develop "between market and hierarchy". Although in the later development of TCE such intermediate forms are accounted for to some extent in "bilateral and trilateral governance", not all the evidence can be assimilated. The empirical anomalies can be summarized as follows: there is outsourcing of productive inputs in spite of high (not just "intermediate") transaction specificity of related investments. Even then, there appears to be a lack of the safeguards against discontinuity that TCE prescribes.

According to TCE ceteris paribus increasing uncertainty should lead to less outsourcing, since greater uncertainty yields more opportunities for opportunism to be exercized. In fact, we observe both increasing uncertainty, in both technology and market conditions, and an increase of outsourcing. Of course, the ceteris paribus assumption may not apply: as discussed in Nooteboom (1991b), the development of information and communication technology helps to reduce transaction costs, and thereby enhances the tendency towards outsourcing.

In "industrial districts" or "flexible specialization", as discussed by Piore and Sabel (1983), there are configurations of partial cooperation and partial rivalry between small firms with high apparent innovative success that are difficult to fit in in TCE. The evidence should be interpreted with care, as indicated by Amin (1989), but it nevertheless appears as an anomaly in TCE.

When we turn to the evidence of individual cases of subcontracting, care is required. When one observes highly transaction specific *products* (specialties tailor-made for a specific user), these do not necessarily involve transaction specific *investments*. With highly flexible machinery (increasingly available from applications of information technology) one can produce specific products with non-specific investments.[2] Nevertheless, there is evidence that does appear to contradict TCE. Semlinger (1991) reports that in the German automobile industry "in many cases, buying companies acquire possession of the moulds and dies necessary for the custom-made production of the parts they order", as predicted by TCE, but that the supplier regards this as a threat to continuity rather than a help. Furthermore, instead of more guarantees of quantity and price of purchase there is a tendency towards increased flexibility, in spite of higher transaction specificity of investments.

We propose that the theoretical and empirical problems for TCE are connected: the empirical anomalies arise from a shift of focus from static to dynamic efficiency, while the latter is not included in standard TCE.

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[2] For a further analysis of specificity in TCE, see Nooteboom (1990a).

The strategic need of outsourcing

The competitive environment of firms is turbulent. Technological development is fast, yielding, among other things, a faster obsolescence of products and production technology, and more opportunities for differentiated products at low prices. Consumer preferences are becoming at the same time more differentiated (within countries) and more similar (across countries). Many markets have developed from sellers' to buyers' markets, increasing pressure on price and stimulating product differentiation to escape from that pressure. This is consonant with the greater differentiation of demand, combined with greater similarity of demand across countries, allowing for the achievement of economy of scale in spite of product differentiation, by an orientation towards global markets. With the emergence of Japan and the other "tigers", there are more players in the competitive arena. As a result, life cycles of products become both shorter and more synchronized between countries. This necessitates product innovation which is fast, early and wide. Fast, i.e. with the shortest possible time between start and introduction to market. Early, i.e. before the previous generation of the product has outlived itself, or even before it has been introduced to the market. Wide, i.e. in different countries simultaneously, or globally. Firms must simultaneously offer low price, high quality, high flexibility and high innovativeness. Firms in many industries are facing a shake-out which they will survive only if they are expert in the innovation of products and production. To achieve such competence, firms must concentrate on main areas of excellence, thereby outsourcing inputs as much as strategically possible, in spite of high transaction specificity of related assets.[3] Considerations of dynamic efficiency and strategic scope take precedence over considerations of static efficiency.[4]

This gives part of the explanation we are looking for, but we want to yield a more complete and more analytical explanation. So far we have hinted only at an explanation why buyers may accept transactions in spite of highly specific assets. But why are suppliers willing to accept them? Why do we observe fewer safeguards than predicted by TCE? While the solutions provided by TCE may not remain, at least not without important alterations, the problems raised by TCE do remain: in case of highly transaction specific investments, how does one cope with the resulting risks of discontinuity due to bounded rationality and opportunism under conditions of uncertainty? Whatever theory is used to supplant TCE, it should answer this question.

The dimension of time

For a proper understanding of subcontracting relations, we need to consider not incidental transactions, but transactions in the setting of an exchange relation that develops in time. Williamson himself tends to slide into a discussion of transaction

[3] For a complementary view on the strategic import of outsourcing, see Semlinger (1991a, b).

[4] Note that there are limits to the strategic desirability of outsourcing: one may want to maintain an in-house capability for a technology in order not to become dependent on suppliers who are also competitors; because it is complementary with respect to a core technology (economy of scope); because the technology may be the carrier of a new generation of products that one needs to maintain access to.

relations rather than transactions, but even in his later work (1985) backs out of the implications. An embedding of a transaction in an ongoing process of exchange is required to make TCE coherent. Without that, one cannot meaningfully employ the customary parlance of setting up an agreement "ex ante" and coping with problems of control "ex post", with all the complications of monitoring, "haggling", renegotiation, handling hostages, arbitration, etc. The problem of bounded rationality that TCE purports to deal with is that one cannot foresee all contingencies that may occur during execution of an agreement to transact. In other words: new facts or conditions may be perceived in time. But if that is allowed, one must also allow for shifts of the perception and expectation of opportunism, and for shifts of preference or goals. The claim of TCE is not that opportunism is practised by everyone all of the time, but by some people some of the time, but since ex ante one does not know when and by whom, governance of contracts should be designed to take opportunism into account. But then, as a transaction relation develops in time, perceived risk of opportunism is bound to develop as well.[5] What is more, the issue of transaction specificity of assets acquires substance only with the possibility of repeated transactions in the future. If such a perspective is lacking, and it is known beforehand that an investment is fully specific to a single, isolated transaction, the problem is trivial: the investment will be made only if it is recouped in the price to be agreed for the transaction here and now. Non-triviality of the problem of transaction specific assets demands the perspective of possible but uncertain ongoing transactions in the future.

Dynamic analysis

The purpose of the present paper is to offer an exploration in dynamic analysis, aimed at developing TCE into a more general transaction cost theory (TCT). The exploration is used to support, among other things, the development of hypotheses for empirical research of subcontracting relations.[6]

In a dynamic analysis we can no longer take knowledge/technology and preferences as given, and we have to deal with "radical" uncertainty. We make the usual distinction (following Frank Knight) between risk, in which the probabilities are known of given outcomes of given options, and "fundamental" or "radical" uncertainty, in which one does not know all outcomes of a given option, or does not know all the options, or may shift one's goals. The concept of knowledge includes perception and interpretation (which includes understanding or explanation). Preference is associated with evaluation. Learning can be construed as change of knowledge and/or preferences; i.e. change of perception, interpretation or evaluation. This goes together with change of meaning. Change of knowledge can arise on two levels: new outcomes of a given option and new options for the realization of a given goal. Change of preference may involve new goals, which open up the possibility of new options and may alter the value of outcomes of given options. Here, the issue of radical uncertainty has been made part of the issue of learning.

The problem with dynamic analysis, thus defined, is that it places us outside of traditional economic analysis, where preferences are assumed to be stable, and

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[5] Note that it does not necessarily decrease; it may increase in an escalation of suspicion.

[6] Cf. Berger, Noorderhaven, Nooteboom & Pennink (1991). The research is conducted with a grant from the Dutch National Science Foundation, grant nr. 450-227-016.

lack of knowledge is seen merely as limited possession of a good called information, which can be acquired at a cost. Thus, we must look outside of established (neo-classical) economic theory.

A likely candidate is evolutionary theory, for which we might employ the pioneering work of Nelson & Winter (1982), and later work by Mokyr (1990) and de Bresson (1987). From an evolutionary perspective, development of some form of life (species) is the result of sources of variation (in biology e.g. random mutations) in the composition and transmission of characteristics from a pool (genotype) into their embodiment in individuals (phenotpye), a selection environment operating on the individuals, and the transmission of surviving characteristics to subsequent generations. Of course, evolution in a social context is not identical to biological evolution, but evolution is more than a mere metaphor for socio-economic development. It purports to represent a "logic of change" which applies to different kinds of development.

In a social context, mutations are not random, since they are directed by thought, design, planning, cooperation. They are still stochastic, however, since planning is disturbed by the unforeseen, and novelty often is the fruit of chance (serendipity). Entrepreneurship might be seen as the source of variation in economics, yielding novel technology/product/market combinations (TPM's), and the market (plus institutional conditions and politics) as the selection environment. However, in contrast with biological evolution, in socio-economic evolution the selection evironment can be affected by individuals of the evolving species, by the influence of firms or coalitions among them on market structure (concentration, entry barriers, economies of scale and scope) and on institutions. Education, learning, training of successors to the management of successful businesses, growth of the firm, the formation of subsidiaries, licensing, takeovers, and the shaping of market structure and institutions can be seen as mechanisms of transmission. Contrary to biological evolution, in socio-economic evolution transmission of acquired characteristics (Lamarckianism) is possible. While in biological evolution genetic transmission maintains characteristics integrally, in socio-economic transmission there is dilution and drift of characteristics. Furthermore, in contrast with biology, in social evolution we have the possibility of cross-species transfer of characteristics.[8]

While Nelson & Winter (1982) took firms to constitute a species, later scholars (de Bresson, 1987, Mokyr, 1990) took techniques: it is the survival of techniques not firms that captures the crux of economic evolution. It seems that we should allow for selection on the level of both species and individuals within a species.[9] A recursive application of this would yield a hierarchy of selection processes and levels of evolution, which can influence each other: of ideas in people and firms; of TPM's and firms in markets; of industries and institutions in society; of societies in global development. We would thus have a multi-level theory to account for

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[7] There is "genetic drift" in biological evolution as well, as a result of "copying errors", but apart from such errors genes maintain their integrity (in Mendelian processes of combination), whereas in cultural transmission shifts of meaning due to difference of interpretation and understanding are inherent rather than incidental.

[8] In biology, cross-species mating is impossible (or in any case does not produce offspring), while in social evolution there is "off-spring" without mating, and cultural "parenthood" goes far beyond biological parenthood.

[9] According to Vrba & Gould (1986) this occurs also in biology.

social evolution. In the remainder of this article attempts are made to offer elements of such a theory: cognitive development in individuals, development of meaning in discourse, and of new TPM's in markets.

To fully develop evolutionary theory for socio-economic systems, we need a theory of knowledge (epistemology), and in particular of the development and acquisition of knowledge (genetic epistemology), which takes us into developmental psychology. Change of perception, interpretation and evaluation implies change of meaning, which takes us into theory of language. Particularly in the context of transactions we need to include in our exploration the role of relations between subjects in the formation of knowledge, preferences, and meaning. This inevitably takes us into sociology. As a result, our present exploration might be called philosophical in the sense that it is pre-scientific: in terms of Kuhnian methodology, it tries to contribute to the development of a new dynamic or evolutionary paradigm rather than conducting "normal science" within the established paradigm of established economics. The area to be explored is so wide that it would be impossible, and counterproductive, to give a resume of all theories from philosophy, psychology, linguistics and sociology that might be germane. The focus will be on a few philosophers that are particularly relevant and also relatively unknown to economists: Jean Piaget, Michael Polanyi and Ferdinand de Saussure. The working hypothesis is that by taking up their views we will contribute to new theory.

Our focus is on issues of knowledge (learning) and preference (preference formation) in transaction cost theory, which have implications for TCE via the behavioural assumptions of bounded rationality and opportunism. We concentrate on the question how subjects change their knowledge and preferences, and how this is related to interaction between them. Since the focus is on inter-firm relations, the analysis is situated on the micro level of individual firms, rather than on the micro-micro level of individuals within firms. This requires that in the use of psychology and sociology the necessary inferences have to made from individual people to groups of people. For example, when we talk of a perceiving "subject" it is a firm, and a question is how perceptions of individuals make up the perception of a firm. This yields important and interesting issues of organization which in the present paper we can only treat very restrictively. Ultimately the connection should be made in a multi-level theory hinted at before.

Bounds of rationality

The boundedness of rationality goes beyond the cost or scarcity of information and limitations in the capacity for its processing. A well known problem, within mainstream theory, lies in Arrow's paradox of information: If one does not have information, one is not likely to know its marginal utility, and marginal cost may be unknown as well, so that one cannot balance the two in the maximization of utility. The transaction specificity of information is also likely to be unknown beforehand. If one does have all that knowledge, one is likely to already have the information and no longer needs to invest in its acquisition. To acquire information rationally, in the traditional economic sense of balancing marginal cost and marginal utility, one must rely on "evaluative" prior information (info2) on the marginal cost and revenue and the transaction specificity of the information (info1), to be obtained from others who already have it (info1), which raises sec-

ond order issues of transaction costs of that prior information (info2). What risks of opportunism are there in the acquisition of the evaluative information (info2)? Since investment in human resource assets is often investment in information, knowledge or skill, rational decision-making concerning such investment is problematic in principle. Williamson (1985) was certainly aware of this problem. This arises for example in a discussion of the position of a worker who has to decide whether to participate in training which may be so specific to the present firm that it ties him further to it. To find out how firm specific the course is, it would for a lesser risk of opportunism be better, in principle, to ask the union than to ask the firm's personnel department. But the relevant problems of knowledge go much deeper. For a dynamic theory we require a theory of acquisition and change of knowledge (genetic epistemology), for which useful ideas can be obtained from the work of Jean Piaget[10] and of Michael Polanyi.[11]

Categories of understanding

Implicitly, neoclassical theory and TCE assume that while information may be costly to obtain, and capacity to process it may be costly or limited, they are in principle available to all in a given form, containing or generating objective truth. It is a matter of cost only; not a matter of competence or time required for absorbing information. The underlying empiricist epistemology, however, is defunct and really has been since the philosopher Kant. In terms of Kantian "critical" philosophy: mainstream economics is uncritical of perception and knowledge.[12]

Perception and thought are conditioned by categories of understanding, in the double sense of being made possible and being limited by them. Apart from giving form or coherence to otherwise senseless sense impressions, categories perform the heuristic function of shutting out impressions that do not fit the present purpose. To be receptive to and explicitly aware of all available bits of information all the time, regardless of context or purpose, would eliminate all purpose, if it were possible. The problem increasingly is not how we can obtain all available information, but how we can ignore irrelevant information. Or in the terms of Polanyi, at any moment we have "focal" awareness only of some pockets of information, while the rest of available information lies in "subsidiary" awareness. Much information and knowledge is "tacit": we are hardly aware that we have it. Sometimes the influx of information or its triggering of action is obstructed consciously, for strategic reasons, to achieve a "pre-commitment" to certain actions. An example is the famous case of Ulyssess, who had his crew block their ears and himself tied to the mast of his ship, in order for him to listen to the sirens without the possi-

[10] The term "genetic epistemology" is derived from the work of Jean Piaget. For the work of Piaget and criticism see Flavell (1967), Piaget (1970, 1973), Mischel (1971). There is no space to go deeply into this literature. Let me only state that I am aware of the criticism of Piaget's work, and that to a limited extent I concur with it, but that I still think that some of Piaget's ideas can legitimately and usefully be employed, as a general "logic of change", or the beginning thereof.

[11] Cf. Polanyi (1962, 1966, 1969).

[12] Similar criticism of the epistemological foundations of neoclassical economics and TCE was given earlier by Etzioni (1988), Hodgson (1988), Groenewegen (1989), among others. The epistemology used here is derived from Kant, Bachelard, Piaget, Cassirer, Polanyi, Merlean-Ponty, de Saussure and Quine, among others.

bility of being enticed to disaster, as discussed by Elster (1979). See also ploys of pre-commitment in bargaining, as discussed by Schelling (1960). In the course of evolution, deliberate blocking may become tacit or automatic (instinctive), if it has survival value.

Tacit knowledge is typically acquired in learning by doing rather than by abstract learning, but abstract learning also tends to sink into tacitness. As pointed out by Simon (1983), the role of emotions in rationality is to call attention to some issue of choice and action; to bring some subset of choice into the focus of awareness and rational evaluation. What one considers relevant and what one considers noise depends on one's purpose, outlook and experience, and on the emotional agenda. Different judgements on purpose and relevance make decision making political. The job of politics is to "add apples and pears"; to reconcile different or incommensurable views of the world. Within organisations, apart from a possible divergence between private and firm interest, which is the focus of economic theories of organisation, different functions or guardians of different resources may perceive the interest of the firm differently (cf. the "resource dependence theory" of Pfeffer & Salancik, 1978). To be effective, organisations also have to define the relevant in order to shut out noise, and this requires some coordination of the perceptions and perspectives of individuals within the firm. This function is performed by administrative and social routines, supported by cultural programming (including the use of symbols and rituals). In the wider context of society this role is performed by norms and values, which are also inculcated by social programming. Wholly or partly, the purpose of routines, norms, values and culture is to streamline decision making by a reduction of political haggling; by means of a greater commonality of judgements on purpose and relevance. This can develop (or break down) within but also between firms.

The present theme was taken up and given more clarity and rigour by Heiner (1983). When our cognitive capacity is inadequate to cope with uncertainty and complexity, to the point that we cannot reliably select appropriate actions in some contingencies, behaviour will be constrained by rules that neglect the corresponding options and contingencies, because they cannot reliably be dealt with sufficiently to make the effort worth while. (Radical) uncertainty will make behaviour less erratic, not more. Widening the boundaries of rationality will make behavior more complex and difficult to predict, since it allows for a wider repertoire of actions fitted to contingencies.

In the epistemologies of Piaget and Polanyi, the idea is developed that categories of thought are acquired and developed in interaction with one's physical, social and cultural environment. Intelligence is internalized practice (Piaget). Once acquired, categories may sink to a level of "tacitness" (Polanyi), where they may become permanently subsidiary, then second nature and finally a reflex. There they tend to harden into "epistemological obstacles" (Bachelard), blocking the consideration or even perception of novel phenomena that do not fit.[13]

The tacitness of knowledge has important implications for transaction costs. The implications are particularly relevant to small business, where knowledge tends to be more tacit. In large firms knowledge tends to be more explicit and

[13] Gaston Bachelard (1974, 1975, 1980; reprints of work published originally around 1940) anticipated much of the work of Kuhn (1970). For a review of Bachelard's "histological epistemology", see Lecourt (1978).

formal, since it has to be shared by more people, who do not interact directly, informally and orally.[14]

First, for an outside monitor of some agent it is hard to assess performance if it is based on tacit knowledge of which even the performing agent himself is not aware. Second, if one is unaware of the (tacit) knowledge upon which one acts, that knowledge is hard to transfer to someone else, particularly by explanation and specification of rules. If at all, it can be transferred only by ostension (showing how one does it), or after tacit knowledge has been made more explicit (as a result, building expert systems may not be as easy as some people seem to think). Transfer is more easily performed by the transfer of the person (or the firm) in which the knowledge is embodied. The difficulty of copying tacit knowledge has the advantage of making innovative rewards from it more easily appropriable.[15] Third, it is difficult to be critical of one's own knowledge, or skill if they are tacit. As taught by Rogers (1983), the first stage in the adoption of a new product is awareness of a need and of the availability of a means to satisfy it. With tacit knowledge this is problematic. The marketing of a new product may require an explicitation of tacit knowledge before a potential customer can attain awareness.[16]

Some of these issues were recognized but not carried through by Williamson, which is remarkable in view of the fact that he is one of the rare mainstream economists to recognise the relevance of Polanyi's work.

The dynamics of categories

According to Piaget the acquisition or development of novel categories arises from successive stages of "assimilating" experience in present categories, which provide both the basis and the incentive for "accommodation" towards a novel category, as a transformation and novel synthesis of preceding categories.[17] The successive stages of assimilation are:

- "recognition and repetition": recognition that observations of an as yet ill defined class can be subsumed under a novel category, whereby the latter becomes more determinate.
- "generalisation": explorations of the boundaries of a category: how far can it be taken to apply?
- "differentiation": how do different applications of the category differ; what modifications are required in different contexts; what patterns in this differentiation may be identified?

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[14] For a further discussion of effects of scale in transaction costs, see Nooteboom (1990c).

[15] This is important especially for small firms, where knowledge tends to be more tacit, and for whom the costs of filing for a patent are relatively high due to the threshold of a minimum cost.

[16] For the implications for the marketing of business services to small firms, see Nooteboom, Zwart & Bijmolt (1992). For the implications for government supported transfer of technology to small firms, see Nooteboom, Coehoorn & v.d. Zwaan (1990).

[17] The merit of Piaget's work, as I see it, is that to some extent (though not completely) it fills the gap that Kuhn (1970) left between "normal science" and "revolution". In Kuhn's view "puzzles" were part of normal science, while the accumulation of "anomalies" leads to revolution. How does this process work, and when do puzzles turn into anomalies?

- "reciprocation," as a prelude to accommodation: where do applications impinge on other categories, and how do these differing categories interact. Novelty often arises from novel combinations of categories which before where perceived as unrelated.

Parts of knowledge develop in interaction with other parts of knowledge. Piaget's theory clarifies the rationality of a certain amount of cognitive and theoretical conservatism, which was proposed, notably, by Kuhn (1970). It is not only unreasonable and uneconomic but cognitively infeasible to satisfy the demand that a practice or theory be rejected as soon as any misfit in its application occurs (as suggested by Popper's methodology of falsificationism). First, how can one know that it "really" is a misfit if the boundaries of validity are not yet clear; when one does not yet know whether or not it can fruitfully be adjusted to assimilate the apparent misfit? Second, how can one know in what direction to look for a replacement if one has not explored boundaries of validity; differences in application; interfaces and connections with other concepts, practices or theories? Novelty does not spring forth fully equipped like Athena from the brow of Zeus.

Implications for opportunities and costs of transactions arise from the fact that the transfer of technology, skill or knowledge that may be required to enable production of a product is problematic to the extent that the developmental sequence of stages has to be "lived through" for effective adoption. This need not always be the case, and care must be taken not to absolutize the Piagetian sequence: much can be transferred by teaching, training, purchase of technology embodied in machinery, hiring experts or taking over a specialized firm. But not everything and not always: often, the effectiveness of technology depends on the context and the experience of an organisation, and the pattern of activities that determines its "scope". In Piagetian terms an important question is: can the technology be assimilated in present categories, or is an accommodation required? A first implication for TCE is that such obstacles in the acquisition of technology, or more generally the resources required for production, can decide the issue whether to make or to buy, perhaps very much regardless of risks of opportunism or specificity of assets.

Williamson proposed, incorrectly in the view of the present author, that technologically inseparable effects of scope are not very significant; that to the extent that they occur they do so only up to a modest scale (the largest scale of inseparable scope effects that Williamson could envisage was that of an orchestra; cf. Williamson, 1985, p. 88, footnote 4). A second implication of the above is that the dependence of learning on context and experience considerably increases the importance of effects of "scope": more activities will have to go together because they are technologically or cognitively inseparable than assumed in standard TCE. This is related to the issue of "path-dependency" that arises also in evolutionary economics: if practice in a given context shapes the capacity for learning a new practice, path-dependency appears, whereby it is difficult or impossible to shift from one trajectory of development to another.[18]

[18] Cf. Dosi (1988), David (1985).

Cross-firm economy of learning

When we turn to the perspective of dynamic efficiency, the above analysis indicates the need of partnerships with other firms, particularly firms that are similar (though not identical) or complementary to one's own production. These partnerships serve to overcome obstacles to learning due to tacitness of knowledge, delays in the process of learning, effects of scope and context, and path dependency in learning, and to contribute to the process of assimilation (particularly reciprocation) and accommodation. One needs others to perceive, interpret and do what one could not do one-self for lack of the proper perspective, understanding and experience. In a static context of stable technology, stable consumer preferences and stable arena's of competition the problems do not arise, but under present conditions of turbulence they do.

In other words: inter-firm relations solve a paradox faced by firms in a turbulent environment. On the one hand, in order to survive firms must focus on their specific area of competence, and this limits the width of perception, interpretation and evaluation. On the other hand, they must remain receptive to changes in the environment that might create new opportunities or threats. To resolve this, firms focus on "core activities" while using relations with suppliers, customers, competitors (in temporary and local or partial "strategic alliances") and others as signalling devices and as triggers or sources of new competences when the need for them arises. The underlying assumption is that in view of links of complementarity (suppliers, customers) or similarity (competitors) their idiosyncracies in knowledge and preferences (perceptions, interpretations and evaluations) are likely to be relevant. In subcontracting relations, this may well be as important for the producer as for the user. Note that this could explain outsourcing in spite of highly transaction specific investment, for the reason that one simply would not be capable to produce the input in-house at an acceptable level of quality and dynamic efficiency.

In Nooteboom (1991 a) the notion set out here is formalized, and it is claimed to yield a type of "economy" on a par with the established economies of scale, scope and experience, in what may be called "cross-firm economy of learning". While economies of scale, scope and experience can only be achieved by a combination of different activities in one context (firm), this economy of learning can only be achieved in linkages between different contexts (firms), i.e. firms which are sufficiently independent to have their own categories of perception and interpretation, associated with different paths of experience.

The analysis gives an epistemological underpinning of the "strength of weak ties" in "loosely coupled systems" noted before by Granovetter (1982). If autonomy of a part of a system is defined as the probability that it can survive separation for the system[19], what we are saying is that for cognitive reasons increased turbulence yields a reduction of autonomy: severance of interfirm connections reduces probability of survival. In the perspective offered by Heiner (1983): on the level of individual firms the scope and flexibility of perception and action is reduced because of insufficient reliability of coping with a wider set of options and contingencies, but by inter-firm links between such more constrained units, greater flexibility and scope is achieved on the higher system level of firms with

[19] As defined by Gouldner (1959), quoted by Semlinger (1991b, p. 8).

links between them. Note that the effect of cross-firm learning requires difference of perception and interpretation, but also a certain commonality of concepts, practices, procedures and perhaps organizational structure, sufficient to establish and maintain an effective linkage: a common "language" has to be developed. To the extent that this is specific to the transaction relation, as it is likely to be at least to some extent, this represents another and possibly major transaction specific investment. Since the investment takes time to develop, in ongoing experience of interaction, and has a certain minimum size, depending on the complexity and specificity of the linkage, the transaction relation is required to last some time to make the investment effective and worth while, which contributes to an explanation of why such relations are often lasting to some extent. This claim will later be supported by means of the linguistic philosophy of Ferdinand de Saussure, which claims that meanings of terms follow from communicative interaction as much as they precede it.

Furthermore, the analysis helps to understand why not only the buyer but also the supplier is willing to enter upon transaction specific investments, even in spite of absence of guarantees as prescribed by TCE. In standard TCE a symmetry of dependence between buyer and supplier is suggested too easily. The dependence of the supplier is evident, in the paradigm case of transaction specific investments in production. The buyer is assumed to become dependent as well because in case of discontinuity of supply no other supplier will be able to supply a product of equal quality or price immediately. Thus the price of discontinuity to the buyer is higher price of the product, lower quality or delay. This is no doubt plausible, but the price and risk involved in many cases seem to be substantially less than for the supplier, who stands to lose major investments. Here, in the context of cross-firm learning, the buyer also will often have to make a transaction specific investment, which may contribute to more symmetry in the lock-in between buyer and supplier. Here, it might even be wise for the supplier not to have the buyer own the transaction specific assets of production, contrary to standard TCE, in order to better maintain the buyer's dependence on him. This might explain one of the anomalies in TCE theory discussed by Semlinger (1991 a, b): suppliers who would rather not have the buyer own the transaction specific investments for production. A similar explanation, though not based on the epistemology of Polanyi and Piaget, was offered by Semlinger.

Opportunism and learning

It is not actual but expected opportunism that drives TCE, and expected opportunism derives from experience and perception. Allowing for an ongoing transaction relation, which is where problems of discontinuity are relevant, and for change of knowledge (perception and interpretation), we must allow for a change of perceived risk of opportunism as the transaction relation proceeds. Of course, perceived risk need not necessarily decrease: a minor breach of expectation or trust, or even a misunderstanding, may yield an increase of mistrust, yielding measures to contain perceived risks, which trigger further mistrust, yielding an escalation of perceived opportunism. But when on the whole the relation is fruitful, perceived risk of opportunism is likely to decline. Furthermore, if we allow preferences also to change, it is conceivable that continuity of the relation itself becomes part of the

purpose, whether for reasons of loyalty, sympathy, economy of attention or simply out of inertia. In other words: in learning mutual trust may grow.

This brings us to the sociological literature on relations between firms. For example, according to Ouchi (1980), in a process of socialization in "clans", different actors may develop or exchange implicit rules, norms or values that govern their interaction. More on a macro level, North (1990) adduces transaction costs as a reason for the development of institutional arrangements, including sets of culturally determined norms, to contain transaction costs that would otherwise be too high to allow for the degree of specialization on which prosperity depends. Heiner (1983) explains institutions as a means of reducing complexity to compensate for lack of reliability in taking appropriate action.

Here, let us limit the discussion to the development of trust on the micro level of bilateral interaction.[20] According to Berger & Luckmann (1966) any human activity that is repeated frequently is subject to habitualization, which frees the individual from the making of many decisions and thus provides a "psychological relief". This economy of attention is consistent with Simon's notion of restricted capacity for information processing, and with Polanyi's notion of tacit knowledge. In the following we provide a further theoretical basis for such views.

Knowledge and preferences are acquired and developed in interaction with the physical but also the social and cultural environment. This idea emerges in parts of sociology: in "symbolic interactionism" (G. H. Mead), with its interpretive view of sociality as constituted by meaning, or more aptly in "ethnomethodology" (Garfinkel), with its focus on the local, intersubjective production of meaning and social order (cf. Cuff, Sharrock & Francis, 1979 for a survey). If, appropriately in my view, social life is seen as constituted by meaning, and hence sociology as an interpretive discipline, so that language is central, let us consider the philosophy of language. A second reason for considering how meanings arise lies in our earlier thesis that in the development of cross-firm learning a type of language, or some other appropriate basis for exchange, must be developed, and that this takes time. A third reason for turning to a theory of language is that in the development of evolutionary theory it might provide a model for the process of entrepreneurial innovation as a source of variation in the selection environment of markets and institutions. The analogy is that in language speakers produce novel meanings (source of variation) in the context of a speech community (selection environment), and this produces the evolution of language.

Language and innovation

In contemporary philosophy, the traditional consciousness theory of knowledge is replaced by theories of knowledge and meaning which take communication and interaction between subjects as the origin.[21] The French linguistic philosopher Ferdinand de Saussure (1979; reprint of lectures given between 1906 and 1911), in particular, is relevant to our present purpose. Before de Saussure, one tended to

[20] A broader discussion of trust is given in Berger, Noorderhaven, Nooteboom and Pennink (1991).

[21] Here we draw from Freud, Marx, Nietzsche, and subsequently the French philosophers de Saussure and Merleau-Ponty, the "postmodernists" Levinas, Lacan, Lévi-Strauss, Foucault, Derrida, Deleuze, Lyotard, and the Aglo-Saxon philosophers Quine and Rorty.

see meaning as something that is given; established prior to communication, as a presence in the head, as it were, which is expressed in words as fixed vehicles of given meanings. The importance of de Saussure is that he creates a reversal: the meaning of a signifier ("signifiant", in French) results from a collision between signifiers in the field of communication. Meaning is not something that is transferred as a previously existing identity, but something that arises and changes in the use of words and from that process forms thought. "A word means what other words do not mean". Meaning is not constituted by some form of identity of a signifier to some pre-established concept that it signifies, but by differences in use between different signifiers, which build concepts. The link between a signifier and the concept that it signifies ("signifié") is arbitrary in the sense that it is not based on any inherent, objective link of form or substance. A horse could be, and in different languages indeed is, named by any other name. It is because of this arbitrariness of meaning that meaning is and can be inherently social (i.e. intersubjective) rather than personal, and is subject to change.[22] Meaning has no basis in essence and is purely conventional, and therefore we can agree to the shifts of meaning that are required for innovation. This is the marvel of language: its order is not rigorous or strict but yet it is an order.[23] De Saussure explained language ("langage") as consisting of a social order ("langue") and individual usage ("parole"). Langue provides an existing ("synchronic") intersubjective order based on conventionally acceptable relations and combinations of linguistic elements. Parole is a source of ("diachronic") change; deviant individual usage may catch on to be accepted as the conventional norm. For this to be possible, the rules from langue are general but not imperative: there is a certain tolerance for heterodox language use. The "logic" of language is not strict: there are no necessary and sufficient conditions for correct usage of a linguistic term. Rather, there are degrees of acceptability and heterodoxy. The importance of this lies in the fact that without heterodoxy there can be no innovation. But the implication also is that in communication understanding is never perfect in the sense of identity of meaning between speakers.

The implication for TCE is that innovation appears to require interaction between individuals within a firm or between individual firms, with a proper mixture of idiosyncracy ("parole") and intersubjectivity ("langue").[24] To change one's ideas one needs to interact with others, or, more strongly, one develops or indeed obtains one's identity by interaction.[25] This links up with the notion from

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[22] There are important links between de Saussure and Wittgenstein, in the impossibility of a private language, "meaning as use" and the working of language as games people play.

[23] Elsewhere, in Nooteboom (1985, 1990b), I propose that there is a workable methodological order, between the unworkable order of Popper's "logic" and the unacceptable methodological anarchism of Feyerabend, in the general philosophy of science, and of McCloskey and Klamer in economics, and that intermediate order is to be modelled after the non-strict order of language (associated with the notion of "plausibility").

[24] For an application of Piaget and de Saussure to issues of the organisation of innovation, see Nooteboom (1989).

[25] The ideas set out here are similar, up to a point, to the "theory of communicative action" from Habermas (1982, 1984), who also employed the genetic epistemology of Piaget. A difference between Habermas and the present article (and postmodern thinking) is that for Habermas the focus and purpose was intersubjective consensus (Saussurian "langue"), while here the focus is on the disturbance of consensus by innovation (Saussurian "parole"), with little expectation of any "ultimate" consensus. For a further discussion of the implications of postmodern philosophy for the theory of markets, see Nooteboom (1992).

Piaget that in the process of developing knowledge, accommodation follows from reciprocation in assimilation. The present predicament of firms in a turbulent environment can now be formulated as follows: to focus on one's specific competence, one needs to tighten intersubjectivity (langue) within the firm, limiting idiosyncracy (parole). But to maintain sources of innovation, one must then be receptive to parole from outside; from outside partners. However, as a carrier of this, in communication between transaction partners, one needs to develop the intersubjectivity of langue, which requires a certain continuity of interaction. Perhaps Saussure's concept of language can serve more in general as a model of innovation. From an evolutionary perspective, in language the source of variation is idiosyncratic, individual usage ("parole"), the selection environment is the speech community that jointly determines accepted practice ("langue"), and transmission occurs by dictionaries, lexicons, encyclopedia's, textbooks, schools. Understanding of the evolution of meaning may contribute to our understanding of evolution in socio-economic systems. Before, we noted that in economics the source of variation is the entrepreneur (who often is an independent, but may also step forward in the context of a large firm), the selection mechanism is markets and institutions (in a wide sense, including politics and social/cultural norms and values), and transmission occurs by education, growth of successful firms, subsidiaries, licensing, takeovers, and the shaping of market structure and institutions. Entrepreneurship as the source of variation is reminiscent of (the early) Schumpeter. We also allow for entrepreneurship in large corporations, but there rational, directed selection is more likely to reduce the randomness of innovation. With more specialists involved in joint design, and with more hierarchical levels of investment selection, more mistaken ideas are likely to be shifted out, but also unorthodox, brilliant successes. It is often only in hindsight that one can distinguish the two. In small, independent firms crazy ideas have more chance of slipping through, resulting in both more radical failures and more radical successes. With some exaggeration one may argue that the evolutionary strength of small firms lies in what on the firm level may be seen as a weakness of reckless ventures and inability to survive mistakes.

Conclusion

From the perspective of dynamic efficiency, producer-user relations under conditions of turbulence can have a significance far beyond static efficiency in the supply of products to satisfy an existing demand with existing technology. Trading partners may be partners in the formation of concepts by "cross-firm learning"; in the creation of new combinations. One does not solely have a trading partner to satisfy present demands, but to create a potentiality for the satisfaction of future demands. Autonomy reduces dependence but also innovative potential. The development of novelty requires interaction.

In the transition from static to dynamic efficiency, the weight of preference shifts to the decision to buy rather than to make. There are three reasons for this. The first is standard: in order to be expert and at the forefront of development one should concentrate on the activities at which one is best. The second derives from the work on producer-user cooperation by von Hippel (1989): in order to reduce development times of new products and to reduce risks of maladjustment to customer needs, the customer should be brought in as a partner in developing and

launching a new product. A third and more fundamental reason obtains from the above exploration of epistemology: one needs interaction with users, suppliers and competitors in order to acquire or develop appropriate or novel categories of perception, interpretation and evaluation.

In the case of tacit knowledge, interaction facilitates the transfer of knowledge, in learning by doing or exchange of the carriers of the knowledge, that would not otherwise be possible. From the perspective of genetic epistemology, interaction facilitates accommodation to a new idea by contributing to the preceding stages of assimilation; in particular the stage of reciprocal assimilation. From the perspective of Heiner (1983), supplier-contractor relations yield a solution to the problem of insufficient cognitive capacity to reliably cope with uncertainty, by reducing the repertoire of actions and perceptions on the micro level of firms and generating requisite flexibility and scope on the higher level of weakly connected firms. From the perspective of linguistic philosophy, interaction between trading partners facilitates invention as in language new meanings arise from conversation: by interaction one benefits from the innovative force ("parole", entrepreneurship) of someone with a different, complementary background and outlook. As in language new meaning issues from communication; in transaction relations the linkage between firms with different complementary perspectives and competences requires a basis for communication that requires time to develop, on the basis of interaction. This takes time and represents an investment, whereby transaction relations must last for some time to make the investment worth while. The investment is also transaction specific, on the part of both buyer and seller, which may contribute to the symmetry of dependence that reduces risks of opportunism, also on the part of the supplier, provided that he offers unique capabilities as a partner in development. This may lessen the need of the safeguards prescribed by standard TCE.

Furthermore, as a transaction relation endures in time, perceptions and goals may shift to reduce perceived opportunism (but may also have the contrary effect). This also may lessen the need of safeguards against opportunism. Knowledge, but also preferences and norms associated with opportunism are inherently dynamic: one conducts transactions from existing cognitive, affective or normative categories, but the conduct of transactions also transforms and indeed generates those categories. Thus a generalized transaction cost theory can account for observed transactions in spite of high transaction specificity of assets and lack of the safeguards predicted by TCE, as a result of mutual dependence for learning and innovation and/or lower perceived opportunism due to the growth of trust, as a function of succesful performance of the transaction relation. The theory does not always imply greater continuity of exchange relations. It also allows for sudden breakdowns of cooperation due to an escalation of mistrust or misunderstanding.

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