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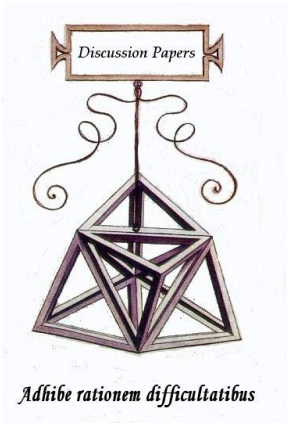

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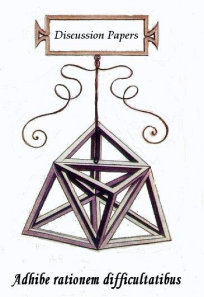

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New insights on the interaction between transaction costs and capabilities considerations in shaping organisational boundaries

Abstract

This paper shows that some explanations provided by transaction costs and capabilities analyses are complementary - rather than independent or rival - accounts of organisational boundaries. Transactions and capabilities considerations interplay in a two-way dynamic interaction in determining the boundaries of the firm whenever there are informational limits that make knowledge difficult to trade and transmit. This interaction is stronger in the presence of uncertainty that prevents individuals from estimating the probability distribution of future contingencies.
The paper is structured as follows. Section 1 introduces the concepts of knowledge transmittability and tradability. Sections 2 and 3 present the conditions under which transaction costs and capabilities considerations are important in vertical-integration and horizontal-expansion decisions. Finally, section 4 is dedicated to the main crossed-linked effects between transaction costs and capabilities considerations in shaping the boundaries of the firm.

Classificazione JEL: D2, L2
Keywords: Transaction costs, capabilities.

1. Introduction: the characteristics of knowledge and radical uncertainty

To what extent and under what circumstances do transactions and capabilities considerations become significant and interact in shaping the boundaries of the firm? This paper intends to answer this question, overcoming the traditional disjunction between transaction costs analysis and capabilities approach.[1] A line of analysis that has emerged in recent years has demonstrated that organisational boundaries may depend both on transaction costs and capabilities considerations.[2] Recognising the importance, in determining corporate boundaries, of both transaction costs and capabilities explanation, allows to see organisational coordination not only as a device that makes it possible to "avoid a negative", such as transaction costs, but also as a device that can "create a positive", enhancing the generation of new capabilities.[3] Hitherto, in considering the interaction between transactions and capabilities considerations, the literature has mainly focused on informational hazards. However, a knowledge-based perspective makes it possible to analyse all range

[1] This paper is a refinement and a development of the analysis of the relationship between transactions arrangement and capabilities development presented in two earlier works (Morroni, 2006:§3.4, 6.3; 2007:31ff.)

[2] For instance, Williamson (1999:49) regards competencies-based and transactions-based approaches as both rival and complementary. Complementarities between capabilities and transactions explanations have been recently stressed, for instance, by Barney and Lee (2000:304ff.); Nooteboom (2003:3ff.); Antonelli (2005); Hodgson (2004a:401ff.); Love and Roper (2005:33-4); Cohendet and Llerena (2005:176-7); Jacobides and Winter (2005:396ff.); Argyres and Zenger (2008:9); Sallusti (2008:12ff.); Leoncini *et al.* (2009:20-3); Pitelis and Teece (2009:5-6); Meccheri and Morroni (2010:80-6).

[3] On this point see Conner (1991:139).

of factors that yield a dynamic interaction between transactions and capabilities considerations. This paper differs from most recent literature on organisational boundaries because it addresses, together with the effects of informational hazards, the influence of transmittability and appropriability characteristics of knowledge, and of radical uncertainty. This allows an integrated understanding of the respective roles of transactions-based and capabilities-based considerations.

Non-transmittable knowledge cannot be exchanged on the market. Knowledge is non-transmittable when there are different languages or contradictions in the cognitive maps, which hamper communication between people, or when knowledge is tacit. Tacit knowledge cannot be expressed in an articulated, codified and formal language such a mathematical formulae, software, books, compact disks, data bases, blueprints, codified procedures and so on. Tacit knowledge is the fruit of learning-by-doing processes and is inextricably embedded in individuals and organisations.[4] Transactional and productive knowledge, as well as "entrepreneurial judgment" have a large tacit component.

The lack of tradability of potentially transmittable knowledge is caused by informational hazards or the presence of non-appropriable knowledge (table 1). There is informational hazard if the contracting party that possesses the relevant private information has an interest in hoarding or misrepresenting and

[4] On non-transmittability that affects make-or-buy decision see Antonelli (2006:229-32,237-38); Morroni (2006:27,36-38).

distorting the information.[5] Non-appropriability may be due to: (i) difficulties to measure knowledge, or (ii) lack of trust, or (iii) non-rivalry and non-excludability of knowledge. (i) Non-measurability depends on the purchaser's inability to make in advance a judgment on the value of the information or knowledge to be purchased. (ii) Appropriability requires trust in the seller; without trust the market exchange of knowledge does not take place. (iii) Appropriability may be hampered by the public-good characteristics of some knowledge when its use by one individual does not preclude its use by another (non-rivalry) and its owner cannot prevent others from using it (non-excludability) (Morroni, 2006:29-30,34).

INCLUDE TABLE 1 AROUND HERE

Radical uncertainty is determined by incomplete and heterogeneous knowledge of the possible outcomes (substantive radical uncertainty) or by incomplete information-processing ability (procedural radical uncertainty).[6] As we shall see, radical uncertainty and the characteristics of non-transmittability and non-tradability of knowledge are important factors that influence the interaction between transactions and capabilities considerations in moulding organisational boundaries.

[5] On the informational hazards and make-or-buy decision, see Nickerson and Zenger (2004:622ff.); Morroni (2006:32-5).

[6] On the concept of radical uncertainty see Dosi and Egidi (1991:165ff.); Morroni (2006:55ff.). For an interesting discussion on the difficulty to predict events and on the vulnerability to unexpected events (Black Swans), see Taleb (2007).

2. Capabilities-based considerations

The firm's capabilities are the abilities to produce specific goods and provide specific services for the market.[7] The firm's capabilities are clearly different from the mere sum of the individual skills of its members; they are rather the result, accumulated over time, of the organisation and integration of the individual abilities of a collection of people (Loasby, 1998:173).

In a situation in which some relevant productive knowledge is not easily transmittable and tradable, performance differences across firms are based on the development of distinctive capabilities different from those possessed by others. The more inimitable a firm's capabilities, the stronger its market position. Non-contestable capabilities are called core capabilities. Core capabilities are related to the set of specialized activities, routines, entrepreneurial, managerial and organisational skills that are embodied in a firm and which "cannot be readily assembled through markets". In strengthening the firm's competitive advantage, the entrepreneurial or executive role in developing new skills and in enhancing the firm's ability to learn is essential. This ability to learn is referred to as dynamic capabilities,[8]

Capabilities-based considerations are significant in shaping the boundaries of the firm in relation to both vertical integration, regarding the

[7] It is useful to distinguish between capabilities, as defined above, and competencies that can be defined as 'chunks' of organisational abilities "identified in terms of performed tasks and knowledge-bases upon which they draw" (Dosi, Faillo and Marengo, 2008:1169-70). So one might talk of legal, medical, mechanical, chemical, accounting, administrative, managerial, organisational, marketing and sale competencies.

[8] Teece *et al.* (1997:516-7, *passim*); cf. Leoncini *et al.* (2006:477ff.).

production of some of its inputs, and horizontal expansion, concerning output differentiation (Dosi and Marengo, 2007:497).

As far as vertical integration is concerned, firms tend to outsource when suppliers possess superior capabilities, despite significant transaction costs. However, higher in-house costs may be accepted "in the short run while capabilities are being developed in-house" (Argyres, 1996:148). In general, organisational coordination or disintegration may prevail according to the governance structure that fosters the creation of capabilities and improves the comparative performance. Whenever learning works worse in a unified organisation than in two autonomous firms, there is an incentive toward keeping the firms autonomous. Conversely, whenever learning works better in a unified organisation than in two autonomous firms and whenever this is also essential for the development of capabilities on which the firm's competitive advantage is grounded, then a strong incentive for vertical integration and horizontal expansion arises. Learning works better in a unified organisation when knowledge is not easily shareable within the market because of informational problems due to scant transmittability or tradability of relevant knowledge.

An example of the abandonment of contracts mediated by the market, motivated by learning difficulties in the relationship with suppliers, is the case of the adoption of the moving assembly line by Ford, in accordance with Tayloristic labour organisation. In fact, the main problem, according to a cognitive perspective, "was [...] the difficulty of changing the suppliers' conception of their own business, and persuading them of the obsolescence of

many of their existing capabilities" (Loasby, 1999:97). In general, as argued by Grant (1996:119-20), "if markets [...] transfer knowledge inefficiently [...], vertically adjacent stages of production A and B will be integrated within the same firm if production at stage B requires access to the knowledge utilized in stage A." Arguably, a specific function of the entrepreneur-manager is to ascertain which distinctive abilities and competencies should be developed within the firm and which should instead be developed outside.

With regard to diversification-based growth, firms tend to expand their scope following the development of capabilities in similar activities that need analogous abilities or complementary components or equipment. Diversification in similar or complementary activities performed under unified governance allows to cope with uncertainty and to exploit economies of scope.[9] A firm that differentiates its production can share risk among various activities. Moreover differentiation involves the development of various individual abilities. Under radical uncertainty, the presence of different kinds of abilities provides "a reserve when the list of future contingencies cannot be closed" (Loasby, 1998:176). This increases the flexibility of the firm in meeting unexpected events.

In producing specific goods, a firm may develop capabilities that turn out to be useful for designing, producing and marketing new products in complementary technology or related markets. Economies of learning-by-

[9] Economies of scope arise if it is less costly to combine the productions of two or more commodities than to produce them separately. In other words, the production of x_1 and x_2 involves economies of scope if $c(x_1, x_2) < c_1(x_1, 0) + c_2(0, x_2)$. Economies of scope derive from the presence of complementarities among different productions

doing become economies of scope when learning advantages are applied across a differentiated production associated with an increased number of different production lines. In greatly differentiated enterprises, what is learned in producing a specific output can often be transferred to the production of another good manufactured by the same firm.[10] The possibility of exploiting the same knowledge within an organisation implies both economies of scale and economies of scope. This greatly affects the boundaries of the firm: for instance, competencies in activities, such as administration, marketing, organisation, etc., or the central information system consisting in software and hardware, can be utilised for the production of a large variety of commodities. Moreover, economies of scale and scope may be reaped, at the same time, by developing capabilities in producing a single component that can be used in the production of a wide range of differentiated commodities. For example, this is the case of the production of small electric motors used to make food processors, hair dryers, fans, vacuum cleaners and various other goods; or the production of liquid crystal displays used to produce calculators, wristwatches, electronic address books, and other commodities.[11]

To sum up, when unified governance enhances learning because of

[10] Richardson (1972:139-40). Alfred Chandler's historical analysis shows that the "ability of large established firms […] to enter related product markets helps to explain a significant change in the ways in which major new industries are coming to be created" (Chandler, 1992:96). By contrast, unrelated diversification tended quite often to fail because companies that move beyond the barriers created by their "learned capabilities" could not capture "economies of scale and scope to obtain lower unit costs" (Chandler, 2009, chapter 1).

[11] These examples are drawn from Milgrom and Roberts (1992:107) and attributed to specific firms, namely General Electric and Casio.

radical uncertainty and non-transmittability and tradability of knowledge, and this is crucial to the acquisition of the firm's competitive advantage, the firm has a high incentive to integrate or join or create organisations of firms.

3. Transactions-based considerations

Transaction costs are defined as the costs of using markets to satisfy economic requirements. Both incomplete and imperfect contracts involve transaction costs that may be due to: (i) writing contracts costs, monitoring and enforcement difficulties between two perfectly rational contracting parties, (ii) the coexistence of cognitive limits, opportunism and asset specificity; (iii) the presence of radical uncertainty.

First, transaction costs may arise whenever agreements between two rational agents are difficult to verify and enforce. Enforcement difficulties spring from the inability of a neutral outsider to verify the accomplishment of mutual obligations in the event of a contract dispute. This occurs because it may be hard to specify in advance, and unambiguously, all conditions and possible external factors. As a consequence, payoff uncertainty may arise. Furthermore, when the number of potential events is very high, it may be extremely costly to spell out all conceivable circumstances in a contract, even if the contracting parties are able to estimate the payoff distribution of possible actions. Statements describing complex situations are inevitably imprecise and ambiguous. It may therefore be prohibitively expensive to measure what each party agrees to yield to the other or to write a contract that describes all the circumstances according to all the possible changes in environmental

conditions, in such a way that a court can verify and enforce the contract. In these conditions, renegotiating may cause deadweight losses (Milgrom and Roberts, 1992:133; Hart, 1995: 23-4, 81, 2009:270).

Second, as highlighted by Oliver Williamson (1990, 1999), transaction costs may arise as a result of the combined effects of cognitive limits, opportunism and asset specificity. Relation-specific investment, which may be difficult to re-deploy, may cause hold-up inefficiency in presence of cognitive limits and opportunism. If market conditions change and if it is impossible to draw up a complete contract, the party that invests in relation-specific assets exposes itself to a hazard, since the two parties have to negotiate over their future interactions.[12] Such bargaining may allow the opposite party to take advantage of the fact that the supplier's investment cannot be used elsewhere. The possibility of post-contractual opportunism triggers hold-up problems because it might prevent an efficient transaction from ever occurring when a party has to make a relation-specific investment. In these circumstances, "the supplier may then be unwilling to make specific investment", or may expend resources in contractual safeguards consisting in rewarding specific assets and in setting penalties in case the contract should be breached before its expiry. In either case, inefficiency results: "either the market does not bring about optimal investment, or resources are expended on socially wasteful defensive measures" (Holmström and Roberts, 1998:74).

Third, high transaction costs may derive from the presence of substantive or procedural radical uncertainty. Although it is undeniable that transaction

[12] Shelanski and Klein (1995:336); Holmström and Roberts (1998:74).

costs are increased by the presence of asset specificity and opportunistic behaviour, it should be noted that radical uncertainty may trigger high knowledge-based transaction costs even in the absence of asset specificity and opportunism. [13] Self-interested individuals with different aims and cognitive maps may react in an unexpected way to changes in environmental conditions that are not forecast and not spelled out by the contract. These reactions, springing from the identification of new interests, may conflict with the opposing party's interests and lead to a costly negotiation, generating deep disagreement and causing losses to one or both parties even if the two sides behave in a non-opportunistic, lawful and honest way.[14]

Transaction costs – due to the presence of radical uncertainty - affect the boundaries of the firm because they favour substitution of the firm's market relations by managerial coordination, resulting in a tendency toward vertical integration through unified ownership.[15] It is interesting to note that unified ownership of different intermediate processes along the productive *filière* may involve economies of scale in other processes, such as for instance in managerial and administrative processes.

[13] On the relevance of uncertainty in determining transaction costs, see, for instance, Dietrich (1994:26); Conner and Prahalad (1996:477ff.).

[14] On this see Conner and Prahalad (1996:483-4) who identify "knowledge-based transaction costs that are independent of the opportunistic considerations explored by Williamson", although they accept "the validity of the opportunistic-based view in explaining some of the motivations for firm organization" (1996:478, *passim*).

[15] An alternative to the unified ownership is represented by the managerial coordination within forms of collaboration among firms (such as long-term supply relationships, strategic alliances, franchising, collective trademarks, consortia, etc.).

4. Cross-linked effects between transaction costs and capabilities considerations in shaping organisational boundaries

The previous two sections have shown that transaction costs and capabilities considerations are equally important in shaping organisational boundaries. In this final section we take a step toward a more complex explanation arguing that transactions-based and capabilities-based explanations, not only are both significant, but in many situations they strongly interplay in a dynamic two-way relationship. Therefore, they can be regarded as complementary rather than separate and competing accounts of the boundaries of the firm. In fact, if there are cognitive limits - that make productive and transactional knowledge not easily shareable because of non-transmittability and tradability - and agents operate under conditions of uncertainty, there is the tendency towards vertical integration. Selecting firm organisation over market contracting involves a reduction in transaction costs, but calls for the development of in-house learning processes aimed at creating the productive knowledge necessary to perform the internalized processes.

On the other hand, outsourcing entails the development of: a) internal capabilities, in order to bargain, design suitable contracts, control quality and enforce contracts; b) external capabilities, in order to educate suppliers.[16] The relations with suppliers require explicit-knowledge exchanges. The development of abilities in contract-design appears to be an appropriate response to the existence of transaction costs that result from the other party's

[16] Loasby (1994); Foss and Eriksen (1995:44ff); Baron and Kreps (1999:9); Foss (2002:160-1).

opportunistic behaviour or from multiple interpretations among contracting parties as a result of radical uncertainty.[17] The development of these abilities makes it possible to reduce transaction costs by carefully crafting appropriate safeguards and by mitigating possible misunderstanding. In firms that rely on outsourcing, internal competencies stretch out beyond the boundaries of the firms' in-house production so that staff can relate to suppliers of equipment, knowledge and components (Brusoni, Prencipe and Pavitt, 2001:598). Investments in specific human assets are essential in enhancing the learning processes needed to master the different technologies adopted in specialized subunits of the firms, but also for the purpose of training the staff members who have to arrange external relationships and have to command multiple technologies adopted by partners who produce various components or supply services.[18]

What matters in determining vertical integration decisions is the final overall effect of different possible organisational arrangements on effectiveness and efficiency.[19] Organisational boundaries depend thus on the relationship between the quality of output and the total average cost that is given by the sum of transaction and production costs. Therefore firms pursue efficiency by reducing *both* transaction costs (mainly due to informational limits) *and*

[17] On differential contract design abilities across firms, see Argyres and Mayer (2007:1062ff.).

[18] Ménard (2004:356); for empirical evidence on this, see, for instance: Gambardella and Torrisi (1998); Brusoni, Prencipe and Pavitt (2001); Takeishi (2001).

[19] Loasby (1998:175); Jacobides and Winter (2005:396). On the impossibility of assessing production and transaction costs separately, see also Milgrom and Roberts (1992:334); Langlois (1998:10).

production costs (linked to the level of specialisation and the presence of economies of scale).

Vertical integration of different processes within a firm is likely to be advantageous in the presence of high transaction costs and low specialisation economies. By contrast, if the outside suppliers can achieve lower costs because of specialisation, related to the development of capabilities and to the exploitation of economies of scale due to higher output volumes obtained by aggregating the demand of many buyers, the firm could outsource its inputs from an external supplier, although there were significant transaction costs. In this case, capabilities and transactions considerations interplay in a conflicting way and capabilities considerations prevail on transaction costs considerations.[20]

There is a two-way dynamic relationship between transactions and capabilities considerations: one the one hand, different capabilities possessed by firms influence their make-or-buy choice; on the other, the level of transaction costs affects the degree of vertical integration of single firms and thus their in-house learning processes that generate new internal capabilities. Therefore "today's integration choice" may reflect yesterday's acquired capabilities, but at the same time today's capabilities may reflect "yesterday's integration choice" (Argyres and Zenger, 2008:8).

Since firms possess different capabilities, they often carry out the same activity with different production costs. Capabilities differential and then

[20] On contradictory implications for governance choices of transaction costs and capabilities explanations, see Argyres (1996:137); Barney and Lee (2000:311-2).

disparity in in-house production costs affect the decision whether to produce inside or to buy from independent firms (Argyres, 1996:130). Furthermore, the characteristics of knowledge and capabilities possessed by firms operating in different technologically-separable-intermediate stages of the productive *filière* (or cluster) influence the effects of a variation of transaction costs on the level of integration. If knowledge is difficult to transfer and capabilities are highly correlated along the productive *filière*, then a reduction of transaction costs will not lead to substantial disintegration. In contrast, if capabilities are weakly correlated along the value chain, a reduction of transaction costs will lead to substantial disintegration (Jacobides and Winter, 2005:399, 410).

On the other hand, transaction costs mould the trajectories of the development of capabilities. Low transaction costs may favour external specialization in single activities and social division of labour, while high transaction costs may induce the development of capabilities within the firm. Furthermore, co-specialization represents an idiosyncratic investment that is exposed to possible moral hazards or more simply to the transfer toward various competitors. In order to keep relevant abilities and competencies inside the firm, it may be in the firm's interest to hire individuals "on a more permanent basis rather than secure the use of their services through a contract."[21] However, high transaction costs do not always imply a unified ownership. In some circumstances, organisational coordination of learning processes under hybrid forms of collaboration among firms may be more suitable than vertical integration and unified ownership.

[21] Niman (2004:278). See also Heiman and Nickerson (2002:97ff.).

In conclusion, when informational limits are due to non-transmittability and non-tradability of knowledge, then transaction costs and capabilities explanations can be seen as largely complementary. This interaction of capabilities and transactions considerations increases remarkably whenever cognitive limitations make it inevitable to operate under radical uncertainty.

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Table 1 Knowledge characteristics and radical uncertainty

<table>
<tr><td rowspan="2">Transmittable k.
(explicit and replicable k., common language and cognitive map)</td><td>Tradable k.</td><td>No informational hazard

Appropriability
(measurability of k., trust, rivalry and exludability of k.)</td><td>Exchange of k. within markets</td><td>Transaction costs and capabilities considerations are not significant.
Tendency towards decentralisation</td></tr>
<tr><td>Non-tradable k.</td><td>Informational hazard

Non-appropriability
(difficulties to measure k., lack of trust, non-rivalry and non-exludability of k.)</td><td>Exchange of k. within organisations</td><td rowspan="3">Transaction costs and capabilities considerations are significant and interplay.
Tendency towards organisational coordination</td></tr>
<tr><td>Non-transmittable k.
(tacit k., different languages, heterogeneous cognitive maps)</td><td colspan="2">Non-tradable transmission</td><td>Creation of k. within organisations (learning by doing and by using)</td></tr>
<tr><td>Radical uncertainty</td><td colspan="3">Substantive radical uncertainty
(incomplete k. of possible outcomes)

Procedural radical uncertainty
(incomplete information-processing ability)</td></tr>
</table>