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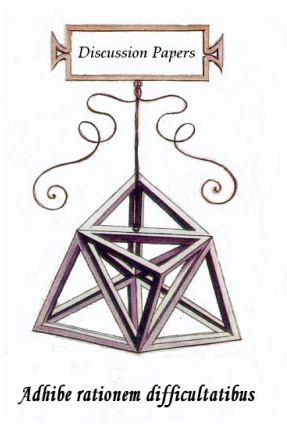

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Incentive-Based and Knowledge-Based Theories of the Firm: Some Recent Developments

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Abstract

Incentive-Based and Knowledge-Based Theories of the Firm: Some Recent Developments

This article presents a critical review of advances in incentive-based and knowledge-based theories of the firm. In particular, we address some developments in the incentive-based approach regarding relational contracts and contracts as "reference points". As far as the evolution of knowledge-based theories is concerned, we focus on the interesting implications of the concept of dynamic capabilities. Finally, we investigate some recent attempts to bridge these two main streams of research, which have for a long time been regarded as rival rather than complementary.

Classificazione JEL: D21, D23
Keywords: Theory of the firm, contracts, incentives, knowledge, competencies

1. Introduction

In this article, we aim at presenting a critical review of recent advances in the economics of the firm. Why do firms exist and what determines their boundaries are central questions in economic theory, industrial organization and management strategy. These issues were addressed first by Coase (1937), in his classic path-breaking article "The Nature of the Firm". While initially few economists took Coase's question seriously, it has increasingly become an important research topic. Indeed, Coase's argument, regarding the emergence of firms in response to the inefficiencies arising from transaction and contracting costs, is a fundamental cornerstone, but it has left several related issues to be answered. The recent literature, which has tried to analyze these issues, can be roughly divided into two main strands: the incentive-based and the knowledge-based perspectives. A particular feature of this article is that it considers both these two streams of research. Within the incentive-based theories, firms are regarded as organizations that provide efficient solutions to contract incompleteness due to informational problems arising from knowledge asymmetries among contractual parties. By contrast, within knowledge-based theories, firms are seen as organizations that produce, store and use knowledge to create and sustain a competitive advantage in response to the incompleteness of technical and productive knowledge. One of the basic differences that characterizes these two main streams of research is that, in incentive-based theories, asymmetric information does not prevent agents' farsightedness, whilst, in knowledge-based theories, technical and productive abilities are not homogeneous across organizations and agents are generally characterized by myopia and other significant cognitive anomalies. Obviously, divergent assumptions on the agents' cognitive abilities strongly affect the results of the analysis.

Let us enter some caveats. Firstly, in what follows we concentrate on organizational boundaries and we do not consider, except incidentally, related

topics in organizational economics, such as authority and delegation in hierarchical organizations (see Garrouste and Saussier 2005). Secondly, we focus exclusively on theories.[1] Finally, this essay is not an exhaustive survey of the wide literature on the economics of the firm. Indeed, we discuss some novel contributions within the incentive-based and knowledge-based theories that, in our opinion, deserve particular attention.

The remainder of the article is organized as follows. In section 2, recent advances of the incentive-based strand are presented with particular reference to two theoretical approaches based on contractual peculiarities: relational contracts and contracts as "reference points". Section 3 is dedicated to recent developments in the knowledge-based theories. Finally, section 4 concludes taking into account some interesting convergence processes between incentive-based and knowledge-based perspectives.

2. Relational Contracts, Reference Points and the Theory of the Firm

Before discussing recent advances regarding relational contracts and contracts as "reference points", let us consider briefly the state of the art of incentive-based theories at the end of '90s from which these two developments originate. A common tenet of the incentive-based view is that the decision to carry out a transaction through the market or inside a firm (or, putting it in other words, the decision about a firm's boundaries) is a matter of economic efficiency. This is because it affects economic agents' incentives in a world characterized by opportunism and contractual incompleteness where, as a consequence, hold-up and moral hazard problems are pervasive. In this line of thought, three main theoretical frameworks dominated the scene at the end of '90s: a) the

[1] For extensive surveys of empirical evidence about theories of the firm see, for instance, Klein (2005), Carter and Hodgson (2006) and Lafontaine and Slade (2007).

transaction costs economics, mainly due to the works of Oliver Williamson,[2] b) the property rights theory of the firm, also known as the Grossman-Hart-Moore model[3] and c) the theory of the firm as an incentive-system.[4] These three frameworks present some similarities but also significant differences. In particular, although the property rights theory was sometimes considered as a formalization of transaction costs economics, these two theories have different implications that often conflict with each other.[5] Moreover, although in the mid-'90s the property rights theory became the reference model in the mainstream theory of the firm, subsequent contributions have highlighted some weaknesses. Perhaps the most prominent is that, assuming sole proprietorships, i.e. business entities owned and run by single managers, it offers a theory of individual ownership of assets, but it does not explain why firms own assets (Holmstrom 1999). Furthermore, considering ownership and control as synonymous, it fails to analyze the role played by agency considerations in defining the optimal firms' boundaries (Holmstrom and Roberts 1998; Bolton and Scharfestein 1998). The theory of the firm as an incentive system (IST) by Holmstrom and others provides its most valuable contribution just on this point, which has been developed by the recent literature on relational contracts.

In what follows we present and discuss two recent theoretical advances with respect to the above three dominant theories, highlighting major novelties.

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[2] Williamson (1975, 1985). See also Klein *et al.* (1978).

[3] Grossman and Hart (1986), Hart and Moore (1990) and Hart (1995).

[4] See, in particular, Holmstrom and Milgrom (1991, 1994), Holmstrom and Tirole (1998) and Holmstrom (1999). We do not consider here important contributions, such as "the nexus of contracts" view (Alchian and Demsetz 1972; Jensen and Meckling 1976) and theory of "corporate culture" (Kreps, 1990). The former has served as important background for further developments, but has presented some analytical difficulties in providing a convincing theory of the firm. For a critical assessment on this, see Hart (1989) and Holmstrom (1999) who compare the "nexus of contracts" view with the property rights theory. On the other hand, the theory of "corporate culture", even if somewhat related to the theories we refer to, does not directly deal with the issue of the boundaries of the firm.

[5] See, in particular, Williamson (2000), Whinston (2001, 2003) and Gibbons (2005) for a broad analysis of this point.

2.1. Relational Contracts

In the theory of the firm based on relational contracts, Baker, Gibbons and Murphy extend previous works in various directions.[6] First, as in the theory of the firm as an incentive system, they consider incentive problems related to multi-tasking and performance measuring issues, but with two major distinctions: a) incentive contracts are implicit, or informal, while the theory of the firm as an incentive system considers formal (incomplete) incentive contracts, and b) the framework is a dynamic (instead of static) one, in which parties' transactions repeat and evolve over time. Secondly, while in transaction costs economics Williamson argues that markets essentially rely on formal contracts (i.e. enforceable by courts) and firms may use relational contracts to overcome some of the difficulties with formal contracts,[7] by contrast, the relational contracts theory of the firm emphasizes that informal agreements can be crucial between firms as well as within.[8]

Technically speaking, a relational contract is an informal or implicit agreement that cannot be enforced by a third party, such as a court. In many situations, relational contracts may outperform formal agreements. For instance, a relational contract may allow the parties to utilize their detailed knowledge and to adapt to new contingencies as soon as they become known, even when such information is not promptly verifiable by a court. However, just because relational contracts cannot be enforced by courts, they must be *self-enforcing* to be effective: in order to provide parties with incentives to fulfil informal agreements, the contract must be designed so that the value of

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[6] See Baker *et al*. (2001, 2002, 2008); see also Halonen (2002).

[7] See Williamson (1975) and Williamson *et al*. (1975). The idea of relational contracts is built on the early work of Simon (1951). Also Blau and Scott (1962, p. 6) pointed out that "It is impossible to understand the nature of a formal organization without investigating the networks of informal relations and the unofficial norms as well as the formal hierarchy of authority and the official body of rules, since the formally instituted and the informal emerging patterns are inextricably intertwined".

[8] Klein (1996) had already emphasized that relational contracts *between* firms often supplement incomplete explicit contracts and a shock may cause one firm to renege on the relational contract. However, he did not analyze how integration decision may affect the possibility of making an informal agreement self-enforceable, which is instead the key-element of the relational contracts theory of the firm.

continuing the relationship in the future is sufficiently large that neither party wishes to renege on the contract (e.g. Bull, 1987). In this context, the main contribution by the relational contracts theory of the firm is to show that the choice of integration vs. non-integration, or of make vs. buy, matters. In other words, in certain settings, integration may support a "better" relational contract than non-integration while in other settings the reverse holds true.

In order to describe this result in some greater detail, consider the usual transaction between a buyer, *B*, and a seller, *S*. In this case, a convenient way to think of the relationship is that of an upstream party (the seller) that must provide a downstream party (the buyer) with an intermediate item (that, possibly, the downstream party uses to produce a final output). Similarly to the theory of the firm as an incentive system, let assume that, in order to produce, *B* uses an asset (e.g. production equipment) and must choose an effort (or action) *e*, which is multi-dimensional and cannot be verified by a court. Define as *V* the value of the relationship, when *S* provides the intermediate item to *B*. However, there is now also the possibility that, once the intermediate item is produced, it is sold to someone else on the market. This possibility depends on the ownership of the asset because it is assumed that ownership of the asset conveys ownership of the intermediate item produced using the asset. Thus, if *S* owns the asset, he/she has the right to choose between providing the item to *B* or selling it on the market, while if *B* owns the asset (the item), he/she can prevent *S* from dealing with outside customers. Notice that these two different situations represent, respectively, the cases of non-integration, in which *S* is an independent contractor, and integration, in which *S* is an employee of *B*. Define as *R* the value of the alternative use of the item in the market (or *S*'s opportunity cost of providing the item to *B*, when *S* owns the asset) and assume that $V > R$, that is the value of trading the item inside the relationship always exceeds that in the alternative use. This could be related to the presence of some asset specificities (e.g. the asset has been specialized to meet *B*'s needs).

Note that the scenario described above produces a situation in which the efficient solution implies both a) since $V > R$, *S* and *B* always trade with one another, and b) since *V* depends on *S*'s effort, *e* must be chosen efficiently by *S*

(define as e^* S's first-best effort and as V^* the corresponding value created inside the relationship). In order to motivate S to choose e^*, the parties may agree on a contract providing that B pays S an additional bonus contingent to e^*. This contract, however, is assumed to be informal (not verifiable by a court), hence there is always the hazard that B reneges on the promised bonus even if S chooses e^*. Indeed, in a static framework, this would be the most obvious result, but, as is well known, repeating the relationship over time opens up the possibility that the cooperative solution realizes. Now, however, the asset's ownership plays a role. Indeed, B's temptation to renege on the promised bonus is stronger under integration (B owns the asset) since he/she can simply take the item without paying the bonus to S. Thus, making self-enforcing B's promise to pay a bonus is more complex under integration than non-integration (in which S may refuse to sell the item to B if the latter does not pay the bonus). However, under non-integration (S owns the item) there is the opportunity for S to take an action $e \neq e^*$ that increases R, the alternative use value of the item, so as to increase his/her bargaining power *vis-à-vis* B and collect a greater share of V, even if this implies $V < V^*$.[9] Therefore, we obtain a trade-off: in some settings, the first of the above considerations prevail, so integration is more efficient; in others, the second dominates, so non-integration is optimal.

The presentation provided above, although very essential, allows for an outline of its prominent aspects and main novelties with respect to the previous literature. First, hold-ups are possible within organizations as well as between. While taking actions in order to increase the surplus share appropriated through bargaining represents the typical hold-up between independent contractors, on which the previous literature mainly concentrated, reneging on promised bonuses is just a possible example of hold-ups within firms. Other possible examples may concern promotions, task allocation, capital allocation, internal auditing transfer payments, and so on. Secondly, the theory highlights that "the formal governance structure should be chosen not only for its own impacts but

[9] Thus, not only the size of the incentive to renege but also the identity of the party tempted to renege depends on who owns the asset.

also for how it affects the feasible set of relational contracts" (Gibbons 2005, p. 237). Formal and informal structures not only co-exist but also interact and this creates another opportunity to choose the former to facilitate the latter. Hence, a broader understanding of the nature and the functioning of the firm must take this aspect into account. Finally, this opens up new opportunities to study non-traditional (or "hybrid") organizational forms, such as joint ventures, strategic alliances, networks, business groups, and so on, since, in many situations, these non-standard organizational forms can take advantage, much better than traditional ones (i.e. markets and hierarchies), of the benefits that derive from the interplay between formal structures and informal (relational) contracts. In particular, this issue is analyzed in detail by Baker et al. (2008), who show that different possible hybrid forms could be optimal in a one-shot interaction and that the possibility of future interaction modifies the nature of these governance structures in ways that alter the optimal organizational form and the management challenges faced.

2.2. Contracts as "Reference Points"

As extensively discussed (e.g. Williamson 2000; Gibbons 2005), the dominant property rights theory approach always leads to *ex-post* efficiency and the focus of the analysis is on inefficiencies in *ex-ante* investments. This approach, however, is restrictive: particularly, the assumption that parties, using side payments, always bargain *ex-post* with no costs seems a poor description of what happens inside firms. Many decisions made in a firm will be carried out without consultation or negotiation with other firms even when these decisions have a major impact on the other firms. In other words, nowadays it is widely recognized that a theory of *ex-post* inefficiencies is needed in order to provide a more solid theory of the firm, as well as of other related aspects such as firms' organizational forms (i.e. authority, hierarchy and delegation). There are different ways to abandon the *ex-post* efficiency assumption. The most drastic is to assume that some decisions are not contractible either *ex-ante* or *ex-post* but that the control over them can be transferred with ownership. Several

recent articles explore firm boundaries (and internal organization) adopting this idea.[10] Another possibility, on which we will concentrate in what follows, is to introduce behavioural considerations into the analysis, referring to the concept of "contracts as reference points", as in their most recent works on the boundaries of the firm by Hart, Moore and Holmstrom.[11] According to this approach, initial (incomplete) contracts circumscribe or delineate parties' senses of entitlements, possibly because the latter have been negotiated under competitive conditions. Parties do not feel entitled to outcomes not provided by the contract but, if the contract is sufficiently open-ended (or flexible), they may have different views of what they are entitled to within the contract. More specifically, each side may interpret the contract in a way that is most favourable to him/her. When he/she does not get his/her most favoured outcome within the contract, he/she feels aggrieved and shades in the contract's execution by performing in a perfunctory rather than a consummate fashion, creating deadweight losses (*ex-post* inefficiencies). In this context, it is shown that asset ownership becomes important, since it can affect the parties' possibility or opportunity to cause the deadweight loss by means of shading.

Once again, in order to fix ideas, it is useful to provide a formal sketch, largely based on Hart and Moore (2007), of this new approach to the theory of the firm. Consider the standard relationship buyer (*B*)-seller (*S*), with V the value of the item for *B* and R the opportunity-cost for *S* related to the provision of the item (for simplicity, no production costs are assumed). Assume, for the moment, the case of non-integration, in which *S* owns the assets needed to produce the item. Obviously, trade is efficient whenever $V \geq R$ and any initial contract establishing a price p such that $R \leq p \leq V$ reaches the first-best. However, suppose that the realization of V and R is uncertain when parties negotiate the initial contract. In such a case, it may be impossible to find a single price p that will always fall in between the future realizations of R and V. An initial contract providing for a range of trading prices, instead of a single price, may be superior, since the larger the range, the more likely the

[10] See, for instance, Aghion *et al.* (2004), Mailath *et al*.(2004), Alonso *et al.* (2008), Baker *et al*. (2008) and Rantakari (2008).

[11] Hart and Moore (2007), Hart (2007, 2009) and Hart and Holmstrom (2010).

possibility to find a price in the range that falls between R and V whenever $V \geq R$. Nevertheless, the "flexible" contract, with a large range of prices, also has its own cost. Even if both parties regard the contract as "fair", possibly because it is negotiated under competitive conditions, it provides for different possible prices and this can generate disagreement between parties about the appropriate price within the contract. For instance, define as $[p_L, p_H]$ the range of prices of the contract and, without loss of generality, suppose that each party feels entitled to the best possible outcome permitted by the contract, that is, B (S) feels entitled to the price p_L (p_H). This implies that once the final price is chosen in $[p_L, p_H]$,[12] at least one party, and possibly both, will be disappointed by the outcome that actually occurs. What are the consequences of this? It is assumed that each party who is disappointed will shade, i.e. he/she provides "perfunctory" rather than "consummate" performance (assuming that such behaviour cannot be verified and penalized by a court), causing a deadweight loss inside the relationship.

How may asset ownership (i.e. integration decision) affect the efficiency of the relationship in this context? Consider that, in the case of integration, B owns the assets needed to produce the item, thus he/she can get it without S's operations (i.e. B can hire someone else and obtain the item without S). Let us assume, however, that there is the possibility for S to buy the item back from B in order to earn R. This implies that, under integration, if no trade between B and S occurs, the former earns V, while if trade occurs the latter obtains R. In other words, the situation is reversed compared with the case of non-integration: trade is now efficient if and only if $V \leq p \leq R$. In order to provide an intuition as to the role of assets ownership, consider two special cases: first, let assume $V > R$ with probability one. In this case integration dominates non-integration. More precisely, with integration the efficient (first-best) outcome is feasible, while it is not under non-integration. This is because under integration the *status quo* point is such that B owns the assets and earns V (the efficient outcome) without the need to trade with S (who is irrelevant).

[12] The choosing rule is not so relevant for this discussion. Indeed, the initial contract may be assigned to a party with the right to choose the price or provide a mechanism for choosing from the set.

By contrast, under non-integration, *B* can attain *V* only by trading with *S*. This may require a flexible contract (with a large range of trading prices), but this leads to an aggrieved state and shading, which reduce efficiency. By contrast, assuming $R > V$ with probability one, we obtain the reverse result. Now trading is not required to reach the first-best under non-integration, while integration leads to inefficiency because a range of prices is needed to ensure that *B* always trades the item to *S*; however, this leads to shading inside the relationship.

Although the special examples discussed above are necessarily "toy" ones, their logic can be extended in different directions. For instance, using the idea that contracts operate as reference points and the costs of the aggrieved state are important in buyer-seller relationships, Hart (2008) analyzes a situation in which there is *ex-ante* uncertainty about the most efficient method of production and which shows that who controls or decides the production method is a key issue in choosing between organizational forms. Instead, Hart and Holmstrom (2010) provide a model in which deadweight losses from shading interplay with coordination decisions between production units and show that (horizontal) integration and non-integration make the opposite kind of mistake, since, on the one hand, non-integration can lead to *too little* coordination, when the benefits from coordination are unevenly divided across the units, while, on the other hand, integration generally leads to *too much* coordination.[13] All these works, moreover, clarify that, in comparison with previous theories, this approach adds a third important factor in explaining the relationship between asset ownership and integration. While in transaction costs economics the key factor in determining integration decisions is the level of quasi-rents and in property rights theory it is the marginal product of quasi-rents with respect to (non-contractible) *ex-ante* investments (e.g. Holmstrom and Roberts 1998; Whinston 2001; Gibbons 2005), the theory of the firm based on contracts as reference points emphasizes the role of the *variability* of quasi-

[13] In Hart and Holmstrom (2010) this framework is also adopted to study delegation of authority inside organizations.

rents with respect to the state of the world, that is, the role of *payoff uncertainty*.

3. Knowledge-Based Theories of the Firm

This section deals with recent developments of the knowledge-based theories of the firm. Within this large stream of research, firms are regarded as organizations that produce, store and use knowledge to create and sustain a competitive advantage.[14] In the knowledge-based theories, the focus is not on knowledge asymmetries among contractual parties, but on the incompleteness of technical and productive knowledge due to the fact that problem-solving technical and productive abilities are not homogeneous across organizations and agents are characterized by myopia and other significant cognitive anomalies. According to knowledge-based theories, production for the market implies that business organizations enhance their competitiveness by acquiring and increasing capabilities to produce and sell particular goods and services that satisfy the potential demand.

Some knowledge-based analyses distinguish between capabilities and competencies. For instance, some authors define the firm's *capabilities* as the abilities to produce specific goods and provide specific services for the market, for example, to produce a type of software, computer or car.[15] Thus, the firm's capabilities are clearly different from the mere sum of individual abilities and skills of its members. They are rather the result, accumulated over time, of the organization and integration of the individual abilities of a collection of people. On the other hand, the firm's *competencies* are defined as "'chunks' of *organizational abilities* identified in terms of performed tasks and knowledge-

[14] Knowledge-based theories of the firm include behavioral and cognitive theories, Penrosian and resource-based views, Neo-Schumpeterian, evolutionary and competency perspectives. On this see Marengo and Dosi (2005, p. 304ff.) and Dosi and Marengo (2007, p. 491).

[15] Dosi, Nelson and Winter (2000a, p. 3ff.); see also Morroni (2006, pp. 134-5); Dosi, Faillo, Marengo (2008, p. 1166ff.).

bases upon which they draw" (Dosi, Faillo and Marengo 2008, p. 1169). So one might talk of legal, medical, mechanical, chemical, accounting, administrative, managerial, organizational, marketing and sale competencies that contribute to forming the overall capabilities of the firm. According to these definitions, both capabilities and competencies are understood as potentialities that can be triggered in specific contexts.[16]

The various knowledge-based theories agree that the firm's capabilities are not simply acquired but are created. Competitive advantage is the result of the development of different capabilities from those possessed by others. The possession and control of rare, inimitable or difficult-to-substitute resources creates market power. Accordingly, firms will tend to specialize in activities that are based on inimitable capabilities in order to maintain a competitive advantage over their competitors. Non-contestable capabilities are called core capabilities. Core capabilities are related to the set of specialized activities, routines, entrepreneurial, managerial and organizational skills that are embodied in a firm and which "cannot be readily assembled through markets" (Teece *et al*. 1997, p. 205). The inimitability of core capabilities is linked to the existence of heterogeneous abilities which are based on asymmetric information and heterogeneous knowledge. The latter, in turn, are due to conflicts of interest among individuals as well as the specific characteristics of knowledge (tacitness, non-measurability, non-appropriability and non-exchangeability) and the possibility of an unpredictable response by some agent. In this context, the knowledge developed by business organizations through experience helps to explain the differentials in revealed performances among firms.[17]

The specific knowledge, which constitutes the basis of the firms' core capabilities, is built up according to the entrepreneur-manager's business

[16] There is as yet no generally accepted vocabulary on capabilities and competencies. For instance, in a recent article von Tunzelmann (2009, pp. 435ff., 446) provides a different definition of capabilities and competencies. He considers competencies as potential, based on learning by searching, and capabilities as realized, resulting from learning by doing.

[17] Barney (1991, p. 94ff.), Dosi, Nelson and Winter (2000a, p. 6).

conception.[18] Designing the firm's strategy, which is the entrepreneurial activity *par excellence,* involves the formation of new capabilities in anticipation of the possible evolution of market conditions and new business creation. In strengthening the firm's competitive advantage, the entrepreneurial or executive role in enhancing the firm's ability to learn is essential. This ability to learn is referred to as dynamic capabilities. Dynamic capabilities consist of the firm's ability to integrate, build and reconfigure internal and external knowledge to address rapidly changing environments.[19] In recent analyses belonging to both the evolutionary and capabilities-based perspectives, the concept of dynamic capabilities plays an essential role and can be regarded as a common feature of these research perspectives.[20] The formation of new capabilities is made possible by developing or tracking down new abilities and skills. Often the rapid growth of a firm is determined by the strong success of a specific product, which is linked to the capacity to create a competitive advantage by exploiting technological opportunities in complementary commodities and matching potential demand. In a recent paper Pitelis and Teece (2009, pp. 5, 10-11), merging the neo-Schumpeterian and the capabilities-centred tradition, draw attention to the nature and essence of the innovative firm, which is linked to its ability to capture profit from innovation by developing dynamic capabilities, spotting possible future markets and establishing a sustainable competitive advantage. This crucial process of co-creation of new markets tends to change consumer tastes and needs.

[18] On the business conception, see Witt (2007, p. 1125ff.) and Cohendet, Llerena and Marengo (2000, pp. 96-8, 106). See also Shane (2003) and Kalantardis (2004).
[19] Teece, Pisano and Shuen (1997, p. 204), Pisano (2000, p. 129ff.), Fujimoto (2000, p. 246ff.). See also the related concept of combinative capabilities proposed by Kogut and Zander (1992, p. 383ff.).
[20] See, for instance, Dosi and Marengo (2007), Dosi, Faillo and Marengo (2008) and Pitelis and Teece (2009).

4. Convergence Processes between Incentive-Based and Knowledge-Based Theories of the Firm

In the last few years a tendency to spot some complementarities between the knowledge-based approach and the incentive-based theories has emerged. The convergence process between these two streams of research has taken place mainly in relation to three different issues: (1) the interaction between considerations centred on transaction costs and on capabilities in shaping the boundaries of the firm; (2) hybrid forms of collaboration among firms; 3) the relationship between incentives and the development of knowledge. Here below, we examine in detail each one of these three issues.

4.1. Interaction between transaction costs and capabilities considerations

Among recent contributions that investigate the relationship between capabilities and transaction considerations, Pitelis and Teece (2009) stress the necessity to integrate transaction costs and capabilities considerations to capture the essence of entrepreneurial and managerial activity.[21] They intend to "revamp" market failure and transaction cost approaches by taking into account knowledge-based considerations. Markets for know-how may not exist – they claim – for many reasons *including transaction costs*. "However, markets may suffer in their development for reasons other than transaction costs. They may not even exist because the entrepreneurs have not as yet created them". "Entrepreneurs and managers can effectuate coordination that not only saves on transaction costs (in the sense of Coase and Williamson) but also involves creating markets, creating new combinations and capturing value [profiting]".[22]

[21] Complementarities between capabilities and transaction consideration are indicated, among others, by Antonelli (2005); Leoncini *et al.* (2006, 2009); Argyres and Mayer (2007).

[22] Pitelis and Teece (2009, pp. 5-6, *passim*). Interestingly, Pitelis (2002, p. 34) quotes a letter by Coase in which he points out the complementarity of his vision on transaction costs with Penrose's view. He writes: "I do not regard her views as an alternative view to mine in *The Nature of the Firm* but as a necessary addition to it".

Going back to the Knightian idea of non-tradability of "entrepreneurial judgements",[23] Pitelis and Teece maintain that selling an entrepreneurial idea "in the open market may be hard for at least two reasons. First, being tacit, it may be hard to transmit. Second, […] explaining it to anyone can lead to it being expropriated. So we have a two-pronged type of market failure, which, however, is not directly linked to transaction costs." These two points can help to explain "the superiority of organization as a governance structure *vis-à-vis* extant markets" (Pitelis and Teece 2009, p. 10-12, *passim*).

In a germane perspective, Morroni (2006, 2007) investigates the conditions under which transaction cost and capabilities considerations interplay in shaping organizational boundaries and competitiveness. He argues that this interaction is significant whenever there are informational problems, not only regarding transactional knowledge and contract incompleteness, but also regarding technical and productive knowledge. In short, transaction costs and capabilities considerations interplay whenever transactional and productive knowledge are costly, and when some relevant productive knowledge is tacit and non-transmittable. This interaction is strongly amplified in the presence of uncertainty. In these conditions, agents' behaviour is characterized by myopia and other cognitive anomalies.[24]

If productive and transactional knowledge is available of the cost and if an absorptive ability to interpret and use this knowledge is required, then the arrangement of transactions requires the development of internal and external capabilities regarding transactional and contract-design knowledge. The development of these capabilities, which is grounded in specific learning processes, appears to be an appropriate response to the existence of transaction costs due to informational problems.

Decisions about which activities to conduct internally and which to contract out are linked to the choice as to which distinctive abilities and

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[23] Knight (1921a, pp. 211, 251) was the first to introduce the concept of non-tradable entrepreneurial knowledge. For a recent discussion on this, see Niman (2004, pp. 2745).

[24] Morroni (2006, pp. 183-88, 247-51). For discussion and references on cognitive anomalies, see Morroni (2006, pp. 65-70).

competencies should be developed within the firm and which should, instead, be developed outside. Internalizing technologically separable processes through vertical integration involves the development of in-house learning processes aimed at creating the productive knowledge necessary to perform the internalized processes. Internalization implies a reorganization that brings about changes in the division of labour and knowledge. Outsourcing, on the other hand, requires specific learning processes. In particular, 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, potential licensees and franchisees.[25]

The consideration of cognitive matters offers an insight into the different reasons underlying vertical integration or safeguards in contractual relationships. For instance, co-specialization represents an idiosyncratic investment exposed to the transfer of knowledge possessed by some partners toward various competitors. In order to capture all the benefits that accrue from the development of productive knowledge and keep relevant information 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."[26] In other circumstances, vertical integration may instead be motivated by the difficulty of developing suppliers' knowledge. For example, when Ford adopted the moving assembly line, in accordance with Tayloristic labour organization, 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, p. 97). The characteristics of capabilities possessed by firms operating in different intermediate stages of the productive *filière* (or cluster) influence the level of integration. Consider, for instance, two vertically adjacent stages of production *A* and *B*. If markets transfer knowledge inefficiently and production at stage *B* requires access to the knowledge utilized in stage *A*, stages *A* and *B* will be integrated within the same firm

[25] Loasby (1994), Foss and Eriksen (1995, p. 44ff), Baron and Kreps (1999, p. 9), Foss (2002, pp. 160-1).
[26] Niman (2004, p. 278). See also Heiman and Nickerson (2002, p. 97ff.).

(Grant 1996, pp. 119-20). Whenever learning works better in a unified organization 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 integration arises. Conversely, whenever learning works worse in a unified organization than in two autonomous firms, there is an incentive toward keeping the firms autonomous. In other words, integration or disintegration may prevail according to the governance structure that fosters learning and the creation of capabilities.

A reduction in transaction costs may have different effects on the level of integration according to the degree of correlation of capabilities along the various vertically adjacent stages. If 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, figure 1).

On the other hand, transaction costs mould the trajectories of capability development. 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. It should be noted that including capabilities-based considerations in the analysis of organizational boundaries allows us to analyze multiproduct firms both in a *vertical* sense, regarding the production of some of their inputs, and in a *horizontal* sense, concerning output differentiation (Dosi and Marengo 2007, p. 497).

In conclusion, when asymmetric information and heterogeneous knowledge concern not only transactions, but also production activities, then transaction costs and capabilities considerations can be seen as largely complementary, while organization settings and production techniques appear to be interdependent.

4.2. Hybrid forms of collaboration among firms

The interaction between capabilities and transaction considerations plays an important role within hybrid forms of collaboration among firms – intermediate between markets and hierarchies - such as long-term supply relationships, strategic alliances, franchising, collective trademarks, symbiotic arrangements, equity crossholdings, joint ventures, partnerships, consortia, supply chain systems, business associations and networks that may guarantee an effective interface between parties. Hybrids are organizations composed of "legally autonomous entities doing business together, mutually adjusting with little help from the price system, and sharing or exchanging technologies, capital, products, and services, but without a unified ownership" (Ménard 2004, p. 348). George Richardson has emphasized that networks of firms exist because of the need to coordinate closely complementary but dissimilar activities. "This coordination cannot be left entirely to direction within firms because the activities are dissimilar, and cannot be left to the market forces in that it requires the matching, both qualitative and quantitative, of individual enterprise plans" (Richardson 1972, p. 142). When such positive complementarities are present, economies of scale may be reaped by splitting production of intermediate products into small, specialized firms. In effect, "hybrid organizations exist because partners need to develop coordination, which requires interdependent investments."[27]

When complementarities are highly specific, "the interface between purchaser and supplier" has to be actively managed because the supplier needs to understand the purchaser's requirements in detail and the purchaser needs to understand and enhance the supplier's capabilities (Loasby 1994, p. 299). Different firms have different firm-specific capabilities, and ongoing inter-organizational exchange facilitates the transfer and building of technical and productive knowledge. In this context, durable inter-firm collaboration

[27] Ménard (2004, p. 357); cf. Spiller and Zelner (1997, p. 562ff.). Ménard bridges some capabilities and transaction cost considerations. He takes into account both the possibility that contracts may be subject to unforeseeable revisions due to uncertainties and also the existence of asymmetries in resources and information as the main incentive to pool assets (2004, pp. 352-57). See also Ménard (2009, 2010).

consisting of bilateral or multilateral structures may mitigate transaction costs and may be more effective than the pure price mechanism or single unified ownership. Lasting connections among firms enable them to benefit from the advantages of both integration and specialization.[28]

In some circumstances, hybrid forms of collaboration among firms may be more suitable than vertical integration. For instance, even in the presence of high transaction costs, the attempt to integrate complementary activities that are not truly similar, inasmuch as they are based on distinct technologies and may require different styles of management, "is likely to produce lower quality or higher costs, or both" (Loasby 1994, p. 299). In this case, a possible response to high transaction costs might be forms of collaboration among firms rather than unified ownership. Co-specialization among complementary producers entails the co-development of capabilities to reduce possible misunderstandings.

With the increasing need for knowledge in production activities, the knowledge relevant to the solving of problems tends to dwell in a variety of individuals who do not necessarily belong to the same firm. Therefore, under heterogeneous abilities, inter-organizational exchange based on long-term relationships favours the development of firm-specific capabilities, fosters innovative activity and helps to cope with changing environments.

In many hybrid forms of collaboration among firms, internal capabilities stretch out beyond the boundaries of the firms' in-house production so that staff can relate to suppliers of equipment, knowledge and components (Brusoni *et al.* 2001, p. 598). Evidence from applied studies on franchise systems and durable inter-firm collaboration among Japanese manufacturing firms has shown a significant level of investments in specific human assets. Such investments are designed partly with the aim of 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 who have to command multiple

[28] De Jong and Nooteboom (2000, p. 3), Brusoni *et al.* (2001, p. 597).

technologies adopted by partners who produce various components or supply services.[29]

4.3.Relationship between incentives and the development of knowledge

To conclude, let us consider recent advances on the analysis of the relationship between incentives and the development of knowledge. Marengo and Pasquali (2010) make an interesting novel attempt at bridging the gaps between the incentive-based and the knowledge-based theories of the firm by presenting a computational model that studies the interplay between learning, incentives and allocation of decision rights. Apart from very few exceptions, there are scant studies on the relationship between the development of knowledge and incentive structures because incentive-base literature has almost ignored learning processes within firms, making the implicit assumption that technical and productive knowledge is acquired without cost, while knowledge-based contributions have dealt only very marginally with incentives, implicitly assuming that incentives structures play little or no role in the development of capabilities.

Marengo and Pasquali consider, in their computational model, a firm that has to make decisions on a set of n policies $P = \{p_1,p_2,...,p_n\}$. For simplicity they assume that each policy may take only two values $p_i \in \{0, 1\}$ and therefore the set of policies is formed by the 2^n vectors of n binary elements. We will call X this set of 2^n policy vectors and $x_i = [p^i_1,p^i_2,...,p^i_n]$ one generic element thereof (Marengo and Pasquali 2010, p. 6). The authors show that when the learning processes are not significant the allocation of decision rights and incentives are largely substitute. However, when learning is at stake, the organizational structure and the incentives may become complementary.

They study two possible cases with three agents and a principal under given assumptions.[30] The first case is characterized by the fact that the

[29] Ménard (2004, p. 356). For empirical evidence on this, see, for instance: Gambardella and Torrisi (1998), Mowrey *et al.* (1998), Lafontaine and Shaw (1999), Brusoni *et al.* (2001) and Takeishi (2001).

principal knows the set of efficient policies. In this situation the aim of the principal can be achieved through an appropriate design of the organizational structure (decision rights distribution). The same result could be obtained by adopting a monetary incentive. Therefore, in this first case, monetary incentives and the allocation of decision rights are substitute.

In the second case, instead, the principal does not know the appropriate course of action and tries to learn which policies are efficient from environmental feed-back. This situation determines a trade-off between aligning the agents' decisions to the principal's preferences or leaving agents freer to choose policies according to their own idiosyncratic preferences. If, by means of appropriate incentives and/or organizational structures, the principal optimizes the alignment, he/she will have his/her preferred policies efficiently implemented, but agents who may hold better models of the environment and could implement policies with higher performance may be forced into the straitjacket of the principal's vision. On the other hand, if the principal implements looser incentives and organizational structures that divide decision rights less finely, and gives greater freedom to the agents to implement their own preferred policies, he/she may learn that some of the agents' ideas may actually perform better in the environment but on the other hand he/she may lose control of the organization and the latter may ultimately be geared by some agents towards serving their own interests (Marengo and Pasquali 2010, p. 20).

The results of the simulation run by Marengo and Pasquali can be summarized as follows.

i) In environments with low complexity, a fine decomposition of the decision rights and medium-low powered incentives is more efficient.
ii) In complex environments, with low competitive pressure, learning is enhanced if decision rights are concentrated under the control of one or very few agents and the incentives are medium powered.

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[30] In particular, Marengo and Pasquali assume the following: 1) the principal has to make decisions regarding a set *n* of policies to be adopted; 2) agents have control over policies; 3) the principal and the agents hold different preferences regarding policies; and 4) incentives are needed to induce an agent to accept a policy profile preferred by the principal but that ranks lower in the agents' preference ordering.

iii) With significant competitive pressure, the division of decision rights and the role of incentives acquire increasing importance. In this last case the provision of decision rights and the incentives are complementary.

This model is obviously very simple and leaves to further research interesting issues regarding, for instance, the possibilities of learning processes for agents and the cost of hiring agents in relation to their span of control over possible policies. However, this model, in connecting incentives to the development of productive knowledge, indicates a fruitful perspective that bridges interesting features of the two main streams of research analyzed in our review.

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