In search of an evolutionary theory of the firm

draft

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Introduction

The last decades have seen a growing interest in the theory of the firm by economic theory. Different theoretical strands have been developed, each trying to go further than the standard micro model of the firm as a capital-labour function. The original question of what is the firm can be traced back to the classic work of Coase (1937) still, his questions were only again effectively grasped in the seventies by Alchian and Demstez (1972) which tried to justify the existence of the firm during times when mainstream economics was being challenged by non-hierarchical proposals from the emergent radical schools (Tinel, 2002). In the eighties Coase encounters his most close disciples in Transaction Costs Economics (Williamson, 1975), which develop the coasian idea of the firm as the efficient alternative to high transaction costs in markets. More recently, a more hard-core neo-classical theory focused on property rights (Hart, 1990) raised substantially different questions (and answers) about the firm. Despite significant differences, all these theories have a common theoretical background which preserves fundamental neoclassical propositions such as profit maximization or equilibrium approaches.

Even before the current stream of theory had been put in place, non-neoclassical perspectives of the firm were put forward by Edith Penrose (1959) or Cyert and March (1963)\(^1\). Edith Penrose’s work is considered as a distinctive contribution which is at the origin of an alternative theoretical tradition: the competence-based perspective of the firm. Rejecting profit maximization and equilibrium assumptions, this theory focuses on specific knowledge competencies of the firm as the main reason for its existence.

However, the competence perspective, has been a *portemanteau* label for a number of distinct insights and perspectives ranging from strategic management “resource-based”

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\(^1\) We could go back to Veblen (Foss, 1996) or Schumpeter (Nelson and Winter, 1982) to retrieve first contributions.
to “knowledge-based” theories of the firm (Foss, 1996). In this review, we are especially interested in the contribution of evolutionary economics. Evolutionary theory of the firm overlaps, in substantial areas, with the wider competence perspective. Although it was not its main objective, the founding work of Nelson and Winter (1982) substantially developed the competence view. This original contribution was followed by numerous contributions giving rise to an evolutionary theory of the firm.

Long-term economic progressive change was Nelson and Winter’s key concern, but for their theory to be successful they needed to point to an alternative understanding of the firm. Only by rejecting the neo-classical “black box” production function and by understanding the firm as the *locus* of production, could diversity in a firms’ population be acknowledged and, therefore, an evolution process be developed.

However, if an evolutionary approach of the firm has a place of its own in contemporary economics, it is still considered “sketchy and dispersed” (Cohendet and Llerena, 1998), not being “clear that at present there exists a well articulated ‘theory of the firm’ that fits the needs of institutional and evolutionary economics (…)” (Nelson, 1995). Nevertheless, a common set of assumptions and statements of what is the firm can be identified within evolutionary economics. Based on recent work made by evolutionists we argue that there are some distinctive features coming from this theoretical strand which are, if not a theory of the firm as such, major contributions for an alternative perspective. We will then highlight some of these insights while signaling some of its insufficiencies.

In the next section of our work, the role of knowledge inside the firm in evolutionary theory will be clarified. Following the seminal contributions of Herbert Simon (bounded rationality) and Michael Polanyi (tacit knowledge) a perspective of the firm as a knowledge processor emerges. The historical character of this view of the firm is here encompassed, through the path-dependency of the development and evolution of learning processes. In the third and last part, we will try to explain how firms work, mainly exploring the concept of routines, from which the firm’s boundaries can be depicted. Some of the shortcomings of evolutionary theory when facing governance issues are here pointed.
As we already referred, the evolutionary theory of the firm overlaps the competence perspective of the firm. Therefore it should not be surprising that some of the contributions mentioned here are not labelled as evolutionary, but as competence or knowledge-based perspectives. Another previous point to be made, in line of Witt (2001), is the way the evolutionary term is taken. The biological metaphor is not to be understood literally in any of its theories (population-based or natural selection) but in the broad sense as “developmental” theories upon which several economists have built their work.

**The firm as knowledge processor: from bounded rationality to path-dependency**

*Bounded rationality*

One of the most important challenges that the evolutionary theory poses to mainstream economics is the abandonment of the rationality assumption. Evolutionists adopt Herbert Simon (1957) proposal of bounded rationality as an alternative. Rationality is considered to be the fundamental base of human behaviour but reality shows itself too complex to be successfully processed by the individual. As experimental economics has abundantly proven decision heuristics are then used in order to overcome this complexity (Conlisk, 1996). Errors in assessment are common and optimal results difficult to achieve. Bounded rationality emphasizes the role of in-context learning in individual behaviour. This is an important feature of evolutionary theory as we will see.

Nelson and Winter (1982) made an important step forward when they introduced bounded rationality into the realm of the firm. The firm faces the same bounded rationality problems as the individual, using decision heuristics and being vulnerable to mistakes. The adoption of simple rules and procedures at this level resulting from bounded rationality implies the rejection of the profit maximization assumption (in opposition with mainstream theories). The more realistic stance of profit motivated firm is adopted instead:
“(…) these rules and procedures cannot be too complicated (…) ; however, they may be quite satisfactory for the purposes of the firm given the problems the firm faces. Firms satisfice (…)” (Nelson and Winter, 1982: 35)

**Knowledge**

If bounded rationality is adopted for the first time in a theory of the firm, hence overcoming the optimization principle, the most innovative insight that the evolutionary approach presents is the centrality of knowledge in production. Reflecting the transformations of the contemporary world economy, where the stock and extension of knowledge are seen as the essence of modern economic growth (Lazaric et al., 2003), this approach offers the theoretical tools to study issues that mainstream economics addresses poorly. Actually, the incipient role of knowledge in mainstream theories of the firm – in opposition with its raising value in mainstream growth theory – unmask one of its biggest flaws, the neglect of technology and production. In neoclassical approaches uniformity of technology is assumed, allowing the separation of production from the problems of governance structures and transaction costs – which are the concerns for the mainstream theories of the firm (Hodgson, 1998). An exchange centred approach is thus favoured. Markets are taken as the primary institutional form of economic organization, whose failures give rise to others – more efficient - institutions, as eloquently put by Williamson’s quote: “I assume, for expositional convenience, that “in the beginning there were markets” (quoted in Ankarloo and Palermo, 2004). This position has particular implications in the treatment of knowledge – knowledge is reduced to information that can be acquired in the market. As Coase (1937) puts: “We can imagine a system where all advice or knowledge was bought as required”.

In evolutionary economics production ceases to be a “black box”. Production and technology are at the root of the firm, considered as the “locus” of the setting up, construction, selection, usage and development of knowledge (Cohendet and Llerenna, 1998). The seminal contribution in the study of knowledge at this level is the work of Michael Polanyi (1967) with its distinction between codified and tacit knowledge. The first is the knowledge expressed in some sort of language which, therefore, and most importantly, can be stored; the latter, the non-articulated, almost unconscious, knowledge is described by Polanyi in a brilliant formula: “we know more than we can
Polanyi’s distinction was applied to the individual, and was then re-conceptualised by Nelson and Winter (1982) for the firm. The tacit dimension is constituted at the individual level by skills and at the organizational (firm) level it is understood as routines. A useful framework to deal with these different dimensions of knowledge is developed by Alice Lam (2000), which offers not only the epistemological perspective of Polanyi’s distinction (tacit vs. codified) but also an ontological dimension to the previous distinction (individual vs. collective). She considers not only tacit knowledge at the individual level – named _embodied knowledge_ – but also at its collective character – named _embedded knowledge_. This powerful expression of _embedded knowledge_ acknowledges the realm of the firm, by stressing its collective action character, and the role of environment in its processing.

Antonelli (2005a) argues that this conception of knowledge integrating its tacit dimension results in a transformation of the knowledge-understanding paradigm in economics. Knowledge was previously seen as a public good characterized by the non-exclusion and non-appropriability properties and thus as exogenous to the economic analysis. The tacit dimension of knowledge gives it a quasi-private character because it can become exclusive of the firm since it is developed by its idiosyncratic procedures and routines. Rejecting Coase’s proposition of knowledge as a commodity, this quasi-private character has strong implications on how knowledge creation is fostered either at the firm or at the national level and stresses its local character.

Antonelli (2005b) also develops the idea of localized knowledge and its policy consequences for innovation. Localized knowledge results from the dynamic interaction of heterogeneous agents with fragmented and often tacit pieces of knowledge put together in top-down or bottom-up processes. The sources of knowledge are not only internal to the firm but also external and because of that the firm needs to build communication channels and network strategies. This context-specific framework
allows knowledge to gain a rather heterogeneous and idiosyncratic character with various degrees of *tacitness* and appropriation. Governance schemes - namely strong intellectual property right regimes, joint-ventures and efficient financial markets - are then needed to promote these processes not only at the firm level but also in inter-firm interactions. Jensen et al. (2004) in their work on innovation strategies also stress the collective and local character of knowledge within the firm. They present two complementary modes of knowledge learning inside the firm: the STI (Science, Technology, Innovation) based on codified knowledge and a core-scientific structure, producing a global type of knowledge transferable world-wide; the DUI (Doing, Using, Interacting), based on the tacit dimension of knowledge which is the product of relational interactive learning and has a local non-transferable character. If the importance of each mode varies with industry and geographical contexts, innovation cannot rely only on scientific knowledge but also requires a combination of both through learning organisations that increase knowledge “absorptive capacities”.

With these rich accounts of knowledge, the central statement of evolutionary economics on the firm - answering Coase’s original question of why is there a firm - emerges quite naturally: the firm is a “knowledge processor”. The firm not only reacts to the external information – as the mainstream perspectives hold – but also develops, uses and selects knowledge to develop its competences. These learned competences are the firms idiosyncratic resources, product of their accumulation and use, that explain not only the existence of the firm, but its boundaries and ultimately its success or failure. The firm is thus, through the permanence of its competences, a profit-oriented organizational form which is able to coordinate the learning processes implied in production. It provides a cognitive environment to its rationally bounded members where they can predict the actions of others, granting coherence to a process that transcends the individual level. Put in a more simplistic way, it is argued that no individual, or bundle of contracts between individuals, knows how to make cars, only firms as a holistic organic structure do.

From this ongoing work arises one aspect that is of crucial importance to the evolutionary theory: the idiosyncratic character of knowledge that this vision of the firm entails provides one of the evolutionary theory main characteristics, diversity. Firms, even in the same industry, are very different in the way they learn and make things.
Hence, firm population becomes heterogeneous, even when firms do or produce the same things. Only then a selection mechanism of the best practices or firms is meaningful.

**Path-Dependency**

The importance of the environment and the path-dependency of the firm’s evolution is also a distinctive feature of the evolutionary conception of the firm. A number of previously presented points drive the theory to this stance. The first is inherent to the definition of the firm as a knowledge processor. Indeed, learning involves a social interaction dynamic which creates an accumulation of knowledge (explicit and tacit), stored in routines, granting the firm a unique framework for the generation and articulation of continuously evolving knowledge that is continuously evolving in time.

The competences are thus rooted in the historical process that the firm traces. But evolutionary theory does not only value the internal development of competencies, it also detects the role of the external environment – markets, public institutions, etc - on the path followed by the firm (Witt, 2001). There is then a clear step forward made by evolutionary theory when compared with Penrose’s competence-perspective of the firm - and its contemporary followers in strategic management resource-based theory (Conner, 1991). The former values mostly the process of growth and the internal resources mobilized and dismissed which constitutes a more wide explanation of the factors that explain the growth of the firm\(^2\) (Witt, 2001).

Finally the concept of profit-motivated firm leads to the notion of the firm as a dynamic entity, which in its quest for profit and survival, changes subjected to internally and externally constraints. The equilibrium approach of mainstream theories, which overstresses the comparative static explanations to justify the existence of different organizational contexts, is abandoned. Here, the firm appears as a social community specialized in the transference and creation of knowledge which evolves stimulated by its own logics and external environment (Kogut and Zander, 1997).

\(^2\) Witt (2001) partially explains Penrose’s stance with her rejection of any form of analogy with evolutionary metaphors.
The path-dependency argument presents itself as a rupture with mainstream static approaches. The existence and boundaries of the firm can now be understood by its past activities. As we saw in the points above this does not mean that an abstract theory of the firm can be achieved falling in an exclusive empiricist explanation of the firm. Instead the evolutionary approach is able to integrate theoretically in its framework the important empirical historical contributions made on the firm.\(^3\)

However it is important to note that this path-dependency does not mean that the firm is tied to its core competences. For Penrose (1957) the existence of competences not only explains the existence of Pareto-rents but, most importantly, the growth process of the firm. Its continuous learning leads to an accumulation of competences, enabling the presence of new non-core competences which if successful in the changing market environment can determine a shift of the main area of activity an the to go through different paths.

**Routines and Governance**

After answering Coase’s question “what is there a firm?” as knowledge processor another major question needs to be addressed: how does the firm work? How does it manage to coordinate the learning processes?

It should be clear by now that the firm creates rules and procedures for its members with which they can deal with bounded rationality and knowledge processing. Nelson and Winter (1982) identify these procedures as *routines* – a concept already present in Cyert and March (1963) - and argue that “the behaviour of firms can be explained by the routines they employ” (Nelson and Winter, 1982: 126). Taking the biological metaphor, routines are seen as the “gene” of the firm, whereby you can read its “DNA”. Routines are then one of the central devices through which evolutionists have made their theoretical progresses, being widely used since – see, as good examples of the operational ability of the concept when applied to empirical contexts, the work done by

\(^3\) As the well known work of Alfred Chandler (1977).
Lazaric and Denis (2002, 2003) on a French meat firm (Defial) or the study on blast furnace control (Lazaric and Mangolte 2000).

However, since Nelson and Winter’s work, routines have been used by evolutionists with a reasonably broad range of meanings\(^4\). Routines can be acceptably defined as stable sequences of interactions that coordinate the organization’s learning and production processes – as stated above, skills taken at the collective impersonal level. Routines assume this coordination role in the firm, embodying the rules and codes shared by its members and granting, in a simultaneous manner, predictability and coherence to group practices. Given the predictability of routines, fundamental uncertainty is reduced and replication of (tacit and codified) knowledge provided (Becker, 2004). Routines are the “organizational memory” of the firm which offers “an individuality to the firm that is partly independent from the human factor” (Cohendet and Llerena, 1998).

The firm is, thus, a bundle of interdependent diverse routines. Cohendet and Llerena (2003) focused on how different routines refer to different overlapped communities within the firm: epistemic communities, communities of practice and functional groups. The importance of knowledge creation decreases through these communities: epistemic communities develop the codification of knowledge (e.g. R&D departments); communities of practice articulate codified knowledge with practices, encouraging the development of collective competences; functional groups depend of simple disciplinary specialization, being of poor learning capability. If routines are always cumulative processes of knowledge, epistemic group routines are then more easily replicated and more favourable to change than, for example, routines in communities of practice, where they serve essentially as repository of knowledge. There is a dynamic complementariness between routines – leading to synergies – that differ in their uniqueness, depending on which communities or group of communities we are dealing with. It is within these routine dynamics’ – especially when they are of difficult replication outside the firm – that the firm’s activity core area and its comparative advantages lay. Routines are then deeply context-dependent, referring to the communities where they are triggered (Becker, 2004).

\(^4\) Becker (2004) points to the conscious/unconscious character of routines, their understanding as behaviour or action, as examples of current divergent meanings given to the concept.
The recognition of the core competences as highly complementary heterogeneous routines/communities is of central importance for a theory of the firm because the classical question of the firm’s boundaries becomes easier to understand. These boundaries should be where the inter-routine synergies are weaker and as a result routines become easily detachable. A firm of perfectly separable routines is, as Holzl (2005) argues, “(...) devoid of a formal coordination mechanism relating them to each other. Hence, it would no longer be possible to talk about a firm.” The firm should then concentrate their efforts in core competencies with highly complementary routines, where they have their distinguishing advantages. Contemporary empirical evidence show the validity of this proposition, notably through the increasing number of modular productions networks where firms outsource their “detachable” activities (see Sturgeon (2002) for an extensive study of this phenomenon in the U.S.).

Another important aspect of routines is their meaning as a governance device. The first related advantage is the possibility of control: since there is a standardization of practices, comparison, hence control is made easier (Becker, 2004). Still, the major governance aspect focused by the literature is the routines role as truces. It is argued that by their repetitive and permanent character, routines enable some sort of unconscious acceptance of rules, thus preventing potential conflicts. They act as conventions, granting solidity to the firm. The firm then emerges as an efficient governance alternative either to centralized command or market coordination. But if, on the one hand, this feature gives stability to the firm, on the other hand, it entails some inertia to the firm’s dynamics. This implied inertia is one of the major flaws identified by the literature on the subject (Mamede, 2004, Becker, 2004, Holzl, 2005). How do routines evolve? How are they selected? Actually it seems that the most important feature of the evolutionary approach (selection) is absent from this theory of the firm. It is of vital importance to the theory to elicit a theoretical mechanism that can explain innovation and change within the routines framework. Some efforts have been done in this area – notably Hodgson and Kudsen (2004) work, using the biological idea of “interactor” – but an articulation of market and internal “screening” has yet to be accomplished.

The absence of agency in the firm implicit in the notion of routines as truces is another major problem. If as Coriat and Weinstein (1995) note, Nelson and Winter take an ultra-
individualist position where firms are inhabited by distinctive individuals with different cognitive capabilities, routines blur individuals multiple motivations inside the firm. The ultra-individualist stance is hence replaced by a sort of structuralism where routines play a *deus ex machina* role. Important issues in the study of the firm such as incentives and power, are thus left out of the evolutionist approach.

Furthermore, the governance issues are now at the core of mainstream theories, explaining part of their success. Some authors have tried to enrich evolutionary theory with (more mature) Transaction Cost Economics approaches (Cohendet and LLerena, 2001). Dosi and Marengo (2000) recognise – agreeing with Williamson – that routines tend to censor governance issues, naively perceiving actors as benevolent cooperators. Hence, for them, Transaction Costs Economics approach would provide evolutionary theory with an incentive/conflict dimension. This link between theories seems stronger since both have common assumptions as bounded rationality and share close units of analysis (transactions and problem solving procedures). Nevertheless the similarities between theories are only apparent. A trade-off between transactions and problem solving procedures seems very difficult to achieve since, as the authors recognise, the first lacks the second’s path-dependency which significantly “weaken the explicative power of the principle of transaction costs minimisation” (Dosi and Marengo, 2000: 8). To the lack of path-dependency we should add the rejection of profit maximization as incompatible assumptions to the envisaged complementary between evolutionary and mainstream theories.

Witt (1998) when identifying another governance dimension that routines concept obscures – the absence of entrepreneurship –, develops a more in-depth reasoning within evolutionary theory that helps to overcome some of the identified problems. He goes beyond our functionalist definition of the firm as a knowledge processor through the existence of the entrepreneur, shedding some light to what is the firm beyond its functions. Leadership, embodied in the character of the entrepreneur, provides the cognitive (imagined) framework within firm members will act. The reappraisal of the entrepreneur’s role answers some of the questions of how and who imagines the ventures engaged by the firm and how its members are induced to follow a particular business conception. Bounded rationality and situated knowledge have both a prominent role because the leadership is here taken as the “attempt to shape firm members’
perceptions of means and ends” in a bounded rational environment where “agents necessitate highly selective processing of information and this is influenced by socially shaped attitudes” (Witt, 1998: 175). Yet, it is not clear if the leadership inside the firm has to be the characteristic of an individual (probably the owner) since entrepreneurship can be a participatory process as argued by Adaman and Levine (2002).

**Conclusion**

Despite punctual exceptions (Cohendet and LLerenna (1998), Holzl (2005)) the development of an evolutionary theory of the firm has been neglected in evolutionary economics. Nevertheless, an overwhelming firm-level evolutionist empirical work arose, using unique theoretical tools. Evolutionary theory has thus made original theoretical contributions emerging from their holistic perspective of the firm. Rationally bounded individuals, the crucial role of knowledge and the importance given to dynamic development are some of proposals that we hope to have shown that grant the evolutionary approach its own unique place within the theories of the firm. In fact, as pointed by Hodgson (1998), the competence perspective on the firm, which evolutionary theory develops, has deep epistemological differences with mainstream theories, rejecting positivistic conceptions of knowledge as mere information has done by the former.

Yet, further theoretical developments are needed to overcome a strict cognitivist conception of the firm. As we pointed, an evolutionary theory of the firm still has significant shortcomings when dealing with governance issues, easily identified in the deficiencies brought by the routines concept. Crucial issues as motivations and incentives inside the firm need to be addressed using the evolutionary theoretical framework in order to have a coherent theory of the firm.
References


