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PART I

INTRODUCTION

1. Economics and theory of the firm

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1. INTRODUCTION

The title of this Handbook makes reference to the economics of the firm and the theory of the firm. The economics of the firm characteristically concerns itself with issues of firm internal structure, organization and boundaries. The theory of the firm analyses behaviour and strategies in particular market contexts. Traditionally within economics these are viewed as separate spheres of analysis. What happens inside the firm has long been studied independently of what composes the details of the competitive environment of the firm and, alternatively, market strategies emerge from a firm conceived as a black box. An early statement of this separation is provided, for example, by Penrose (1980/1959)

> ... we shall not be involved in any quarrel with the theory of the 'firm' as part of a theory of price and production, so long as it cultivates its own garden and we cultivate ours. (ibid, p. 10)

And to reinforce the same point

> The economist's 'main conceptual schema' is designed for the theory of price determination and resource allocation, and it is unnecessary and inappropriate to try to reconcile this theory with 'organization theory'. (ibid, p. 14)

In a similar vein, but from a different tradition, Williamson (1985) suggests that exogenous technologically separable units exist, that are characterized by some degree of asset specificity. Exchange between these units takes place with resulting transaction costs. The minimisation of these costs then results in firm organisation and more generally institutional development.

Without wishing to undermine the fundamental contributions of either Edith Penrose or Oliver Williamson, it is argued in this chapter that we must move beyond this separation and, for example, examine how firm behaviour, strategies and competition (a characteristic of the theory of the firm) interact with firm organisation. Hence, one guiding principle behind this Handbook is that bridges should be created between these two areas of study. Without these bridges potentially partial analysis can result. Two examples, developed in more detail below, will be sufficient to illustrate this potentially partial analysis. First, an industry or technological life-cycle perspective suggests that the nature of competition changes through time. It is argued below that different approaches to the economics of the firm similarly evolve through time in a manner linked to the underlying changes in the competitive environment. Secondly, it is shown below that when account is taken of strategic interaction in oligopoly contexts this has implications for a basic transaction cost account of the firm. Both examples illustrate the potential importance of creating bridges between traditionally separate areas.

This potential interaction is not, of course, a fundamentally new idea. For example Langlois (2007), Casson (1997) or Morroni (1992, 2006) have developed work on the firm that can be viewed as analysing this interaction. For example these authors suggest that organisational characteristics and decisions can be analysed as affecting firm scale economies. For the

current authors interest in this approach to the firm goes back some time. Dietrich (1994) suggested that we can really understand the firm only by taking account of governance structure benefits as well as costs. The "benefits" encompass what is called here the theory of the firm with a focus on external issues and the "costs" the economics of the firm with a focus on internal issues. More recently Dietrich and Krafft (2011) present a framework to analyse firm development, and specifically vertical integration, based on creating links between technical and organizational aspects of the firm. They suggest that it is a truism that real firms are both a technical and institutional entities. In reality, the firm is obviously a technical unit, namely a unit that transforms factor inputs into outputs. This is originally where the theory of the firm starts from analysing the impact of production and costs functions with demand on the market. Equally, the firm is also an institutional unit, requiring that one pays attention to its basic definition, its identity, its structure and boundaries which has become the usual playground of the economics of the firm.

Of course it is always possible to assume one aspect exogenous (or in the extreme even ignore it) and analyse the other in isolation. However the outcome is likely to end up with a partial analysis. For instance, one can focus on the issue of asset specificity, an exogenous technical characteristic supposed to generate motivation problems in a context of bounded rationality and opportunism, and creating the development of institutional solutions. But an obvious complexity here is that asset specificities imply non-contestable economic relationships that can impact on the nature of the competitive environment. In turn the competitive environment may feedback on to motivation problems. Alternatively, one can also focus on a given organisational structure that may constrain the set of productive opportunities, leading to increasing costs in terms of managerial and complementary assets.

2. RONALD COASE AND REAL FIRMS

This handbook develops a vision of the economics and theory of the firm that echoes work opened up by Ronald Coase with his notion of realism. In his 1937 article 'The Nature of the Firm', Coase proposes a research project that revolves around a realistic theory of the firm (Coase, 1937/1993a):

> it is all the more necessary not only that a clear definition of the word 'firm' should be given but that its difference from a firm in the 'real world', if it exists, should be made clear. Mrs. Robinson has said that 'the two questions to be asked of a set of assumptions in economics are : Are they tractable ? and : Do they correspond to the real world ?'. Though, as Mrs. Robinson points out, 'more often one set will be manageable and the other realistic', yet there may well be branches of theory where assumptions may be both manageable and realistic. It is hoped to show (…) that a definition of a firm may be obtained which is not only realistic in that is corresponds to what is meant by a firm in the real world, but is tractable (…) (ibid, p. 18)

This idea is reflected throughout his various writings, each time further clarified. In one of his most recent article, Coase (1998) returns to the notion of realist theory that the New Institutional Economics can offer. According to Coase this theory is quite different from the institutional economics of Commons and Mitchell, which does not offer any robust theory to organize the vast collection of facts. This theory also differs from traditional analysis, which is a pure theory, highly abstract and little affected by what happens in the real world (ibid, p. 72). Since Adam Smith, economists have mainly focused on the formalization of the invisible hand, i.e. on the analysis of extreme decentralization. However, there are other possibilities to develop economic analysis. We may be interested on how supply and demand determine prices, but we may also analyze the factors that determine what goods and services will be traded on markets and are charged a specific price. Coase believes that economists have

focused only on the first question, as they focused essentially on the issue of refining the toolbox rather than the object of study:

> In saying this I should not be thought to imply that these analytical tools are not extremely valuable. (…). My point is different. I think we should use these analytical tools to study the economic system. I think economists do have a subject matter : the study of the working of the economic system, a system in which we earn and spend our incomes. (ibid., p. 73).

The realist theory of the firm should provide answers to questions like: what are the factors that determine the relative costs coordination within a firm or on the market? What factors determine the coordination between a firm and its supplier, client, partner or competitor? How, ultimately, is achieved the coordination of this complex and interconnected structure of the industry, which is also subject to the influence of the laws, of the social system, of technological changes.

This distinction between pure theory and realistic theory of the firm is also strongly denounced in his speech when he received the Nobel Prize in 1991, when he says that in the pure theory of mainstream analysis (Coase, 1991):

> What is studied is a system which lives in the minds of economists but not on earth. I have called the result 'blackboard economics'. The firm and the market appear by name but they lack any substance. (ibid, p. 195).

However, in his 1993 article entitled 'The Nature of the Firm: Meaning', Coase explains the methodology of his research project. Going back into the reasons that motivated the 1937 article, he explains that the argument has to be based on hypotheses both usable and realistic (Coase, 1993b):

> My article starts by making a methodological point : it is desirable that the assumptions we make should be realistic. Most readers will pass over these opening sentences (Putterman omits them when reprinting my article), and others will excuse what they read as a youthful mistake, believing, as so many modern economists do, that we should choose our theories on the basis of the accuracy of their predictions, the realism of their assumptions being utterly irrelevant. (…) In effect what this comes down to is that when economists find that they are unable to analyze what is happening in the real world, they invent an imaginary world which they should be capable of handling. (ibid, p. 52).

This idea is even further reinforced in a comment of an article by Posner (Coase, 1993c):

> Posner (…) refers to my 'dislike of abstraction'. This is wrong. It is true that I said, in my Warren Nutter lecture, that the assumptions of our theory should be realistic. 'Realism in assumptions forces us to analyse the world that exists, not some imaginary world that does not' (Coase, 1988, p. 65). But I go on to say : 'it is, of course, true that our assumption should not be completely realistic. There are factors we leave out because we do not know how to handle them. There are others we exclude because we do not feel the benefits of a more complete theory would be worth the costs involved in including them. Their inclusion might, for example, greatly complicate the analysis without giving us greater understanding about what is going on. Again, assumptions about other factors do not need to be realistic because they are completely irrelevant (…) There are good reasons why the assumptions of one's theories should not be completely realistic but this does not seem that we should loose touch with reality' (Coase, 1988, pp. 65-66). As this quotation indicates, I do not dislike abstraction. But the right degree of abstraction depends on the problem that is being analysed. What I object to is mindless abstraction or the kind of abstraction which does not help to understand the working of the economic system. My aim is to bring existence an economic theory which is solidly based (ibid, p. 97).

It is therefore clear that the definition of the firm in the real world and in the analysis is a fundamental issue in Coase's work, leading to possible propositions on what is a theory to understand how economic systems work.

In his article "Industrial Organization: A Proposal for Research", published in 1972 following a conference in honor of the 50th anniversary of the NBER, Coase stresses that the object of study of the realist theory he developed is the organization of industry, and not just the firm (Coase, 1972):

> We all know what is meant by the organization of industry. It describes the way in which the activities undertaken within the economic system are divided up between firms. As we know, some firms embrace many different activities; while for others, the range is narrowly circumscribed. Some firms are large ; others, small. Some are vertically related; others are not. This is the organisation of industry or – as it is used to be called – the structure of industry. What one would expect to learn from a study of industrial organisation would be how industry is organised now, and how it differs from what it was in earlier periods ; what forces were operative in bringing about this organisation of industry and how these forces have been changing over time ; what the effects would be of proposals to change, through legal action of various kinds, the forms of industrial organization. (ibid, p. 60).

And he adds:

> But if we are to tackle the problem of industrial organisation seriously, a theory is needed. (ibid, p. 63).

The work he considers as important in guiding a realistic theory of the organization of industry, are those by William Thorp, DH Robertson and Alfred Marshall. These references have inspired his 1937 theory on the nature of the firm and fit also with his article of 1972 on the organization of industry:

> The way in which an industry is organized is thus dependent on the relation between the costs of carrying out transactions on the market and the costs of organizing the same operations within that firm which can perform this task at the lowest cost. Furthermore, the costs of organizing an activity within any given firm

depends on what other activities it is engaged in. A given set of activities will facilitate the carrying out of some activities, but hinder the performance of others. It is these relationships which determine the actual organization of industry. (…). But having said this, how far ahead are we ? We know very little about the costs of conducting transactions on the market or what they depend on ; we know next to nothing about the effects on costs of different groupings of activities within firms. About all we know is that the working out of these interrelationships leads to a situation in which viable organizations are small in relation to the economic system of which they are part. (ibid, p. 64).

Although the NBER contributions in this area were very few in 1972, Coase emphasizes in particular three names Solomon Manufacturer *'The trend of government activity in the US since 1900'* ; Ralph Nelson, *'Merger movements in American industry'* ; and Michael Gort, *'Diversification and integration in American industry'*:

This proposal for more research is founded on my belief that it is unlikely that we shall see significant advances in our theory of the organisation of industry until we know more about what is that we must explain. An inspired theoretician might do as well without such an empirical work, but my own feeling is that the inspiration is most likely to come through the stimulus provided by the patterns, puzzles, and anomalies revealed by systematic data-gathering, particularly when the prime need is to break our existing habits of thought " (ibid, pp. 70-71). Of the three works that I have mentionned, that by Professor Gort comes closest to what I have in mind when I speak of the research on industrial organization that we need today. Professor Gort does deal with the question of a range of activities organized within the firm, and there can be few problems of importance in industrial organization on which he does not touch. However, Professor Gort abandoned the more straightforward methods of earlier investigators, such as William Thorp. He makes the central theme of his book a study of diversification. He measures trends in diversification, and seeks to discover the economic characteristics of diversifying firms, and of the industries entered by diversifying firms. Degrees of diversification are not, however, easy to define or to measure, and the results which Professor Gort presents are difficult to interpret without knowledge of the underlying industrial structure (ibid, pp. 72-73).

As we shall see later in this chapter, the reference to Michael Gort by Ronald Coase is of high importance, since his work together with Steven Klepper on industry life cycles are considered today as a central representation of how the drivers of change operate at the level of firms and industries. This is, according to Coase, the premise of a realistic theory of industry organization.

To develop a general approach to the firm in the spirit of Coase's real firms, one has to recognise that any real firm is made of two bases: technical (T) and institutional (I). The T base is the traditional arena of the theory of the firm and the I base is covered by the economics of the firm. To create linkages between T and I factors we can recognise that each can act in one of three ways (Dietrich and Krafft, 2011): they can act as drivers of change, they can govern change processes and they can act as attractors of change. To understand the philosophy behind this Handbook each of these can be (briefly) considered in turn.

Analyses of the firm that emphasise T and I drivers of change are characteristically Schumpeterian in nature. Although Schumpeter originally suggested that innovation covers both T and I factors modern Schumpeterian analyses of the firm tend to prioritise T drivers with I implications following from this in a manner that can be viewed as governing the details of change processes. Although Schumpeter tends to inspire modern discussions of firm change, equally other early writers on the firm emphasise T and I drivers, for example Smith and Marx. In terms of more modern writing the competence and cognitive views of the firm emphasise that change drivers are firm specific and frequently based on tacit and/or system based knowledge.

The analysis of firm change processes can also be viewed as being governed by T and I factors. For example the modern analysis of modularity and network effects emphasises that firm adaptation is an important topic for analysis. I process factors are similarly important to the analysis of the firm. For example, Galbraith's technostructure can be viewed in this light or the way that cognition and knowledge channel firm development. In addition Commons' analysis of the firm as an amalgam of rules can be viewed in this light. Finally exogenous T and I changes can act as attractors to which firms adjust. This is the method characteristically adopted by Austrian views of entrepreneurship in which firm orientation is viewed as adaptation to market and technical change. In addition transaction cost economics adopts the same abstract logic. With regard to the latter tradition an important implication follows from the attractor logic that is used. As Williamson (1991) himself emphasises, firm adaptation is viewed as economising not strategising. This point is taken up in later discussion in this chapter.

While different approaches to the firm can be analysed in terms of T and I factors that create change drivers, govern change processes and act as attractors, three complexities can be recognised that have influenced the structure and content of this Handbook. First the various elements of the T-I, drivers, processes and attractors framework can be combined. Often this combination is logically necessary. For example within transaction cost economics exogenous technical innovation can change asset specificities that lead to institutional development because of the new attractor(s). But also note that certain combinations create logical difficulties. For example an emphasis on firm processes tends to downgrade the importance of change attractors. In addition, frequently combining the various elements of real firm analysis creates complexities that need to be managed. One approach here is to constrain analysis to concentrate on particular aspects of firm activity as is done in parts VI and VII of this

Handbook that cover what are called “modern issues” and “firm strategies”. The second complexity of real firm analysis is that the various possible linkages upon which it is based do not create closed systems. Instead wider institutions and government policies channel the manner in which various linkages can function. This is reflected in this volume by a number of the chapters in part IV (on the multinational firm) and also in part VIII on economic policies and the firm.

The final complexity of real firm analysis, is one in which the editors are particularly interested. It involves locating the analysis of the firm in particular market or similar effects. This is the logic for the inclusion of the chapters in part VI of this Handbook that cover various “modern issues”. Two such specific market effects are useful tools to create bridges between the theory and the economics of the firm: life cycle theory and oligopoly theory. In the rest of the main body of this chapter, these two approaches to the analysis of firms and markets will be used to explore possible interactions between the economics and theory of the firm. The intention here is that the two approaches provide complementary insights – although we will see that some of these insights are remarkably consistent. The complementarity here is, of course, fundamentally methodological: on the one hand an evolutionary perspective and on the other a comparative static and optimising approach. The intention is not to provide an exhaustive discussion but instead to provide sufficient evidence that analysis of the firm should create bridges characteristically separate areas of discussion.

3. THE FIRM IN INDUSTRY LIFE CYCLES

The growing body of analysis in the field of industrial dynamics since the 1980s may lead people to think that a new domain of research has emerged. This is of course a misperception

since some early contributions provided first steps towards the elaboration of such an approach. Schumpeter (1912, 1942) did significant work emphasising the role of the entrepreneur in the development of innovation, as well as the evolution of industry in a context of radical change. Marshall (1890, 1920) also proposed many lines of inquiry, such as the fact that the economy is composed of different sectors, the growth and decline of which is unequal and intrinsically dependent on the organisation of knowledge. Over the 1980s, however, some authors built on the neglected work of Schumpeter and Marshall, and focused on major changes that have taken place in industry structure, industrial leadership, economic growth and innovation. The research program initiated by Nelson and Winter (1982), which focused on evolutionary theory and economic change, opened the door to new interpretations. In one of these new interpretations, Gort and Klepper (1982) tried to understand the long-term evolution of innovative industries, and assessed that this long-term evolution is essentially characterized by a life cycle in which industries, like bio-organisms, arise in their birth phase, grow and mature in their development time, and decline in their death phase. The industry life cycle clearly added value to the explanation of a large number of regularities occurring in innovative industries: production increases in the initial stages and declines in the final stages; entry is dominant in the early phases of the life cycle and is progressively dominated by exit (a massive process of exit - a shakeout - occurs in the final stages of the life cycle); market shares are highly volatile in the beginning, and tend to stabilise over time; product innovation tends to be replaced by process innovation; first movers generally have a leadership position which guarantees their long-term viability; product variety disappears over time, as a dominant design emerges. One of these regularities, i.e. the shakeout, progressively became a central regularity to be explored in industrial dynamics. Most of the recent debates attempted to clarify when and why a shakeout occurs. Given the large body of literature it is somewhat

surprising that linkages have not been created with the insights offered by the economics of the firm. This is what we intend to do here.

3.1. Development of technology, development of knowledge: possible sources of shakeout

In the 1990s, the literature on industrial dynamics focused more and more on the shakeout phenomenon, and attempted to clarify what occurs in pre-shakeout versus post-shakeout periods. This attention is of course related to the crucial role of shakeout in the industry life cycle: a cycle cannot be observed without a shakeout in mature stages of the industry. But shakeout is also a key to understanding why a given industry is declining, and why major actors of this industry tend to be superseded by new actors creating a new industry. Behind this, there is the idea that a given technology can create profit opportunities for some time, but that new technologies will recurrently be created and replace older ones. This Schumpeterian vision of the dynamics of an economic system has been explored in recent contributions on the shakeout in industry life cycle, with an emphasis on different determinants from a purely external technological shock to more endogenous arguments related to the development of knowledge at the level of the firm .

For Jovanovic and Mc Donald (1994), shakeout is generated by an external technological shock, exogenous to the industry. The first technological shock sets in with the development of the new product being launched on the market. Entry is stimulated by the emergence of new profit opportunities related to this new technology/new product, but subsequently there is a progressive reduction in profit margins and the industrial structure stabilizes on a limited number of firms in the industry. At this stage, which corresponds to the maturity of the industry, a new technological trajectory emerges and again stimulates the process of entry, in

the meantime, involving an adjustment of incumbent firms. The process of adjustment is driven by a stochastic process and only a few firms survive this external shock. The shakeout thus eliminates firms which failed to adapt themselves to the new technology.

Alternatively, Abernathy and Suarez (1978), and Abernathy and Clark (1985) have developed an analysis of shakeout and dominant design. When a firm launches a new product in the market, it must face a high level of uncertainty affecting both the conditions of demand and supply. On the demand side, uncertainty comes from the fact that the firm does not know the details of customers' preferences. On the supply side, the conditions of production are also highly uncertain and may evolve over time. Over time, uncertainty decreases and selection operates. On the demand side, uncertainty decreases once customers of the new product have tested the alternative characteristics, and acquired experience on what they expect from the new product, which characteristics are more adapted to their personal taste and usage. On the supply side, rival producers learn over time and accumulate experience on what customers prefer. In time they also select a series of production techniques which are adapted to low cost production. Since uncertainty decreases, the shakeout appears as an endogenous phenomenon. Product innovation diminishes because most of the actors (producers and customers) are naturally oriented towards the production and consumption of a standardized good. The progressive emergence of a dominant design involves higher barriers to entry which correspond with investments by incumbents in process innovation. Entry is thus limited, and less efficient incumbent firms exit the industry.

Finally, Klepper (1996) relates the shakeout to the timing of entry. The reference is, here again, the Schumpeterian hypothesis on the relation between firms' size and R&D capacity. But the novelty is that this hypothesis is discussed on the basis of a finer distinction between

firms which can eventually be incumbent, new entrant, or latecomer. Process innovation decreases the average costs of large firms, which are the major actors of this type of innovation. However, some key elements may erode the advantage of larger firms. For instance, large firms have to cover specific costs, such as expansion costs, which limit their growth. The activity of R&D can also exhibit decreasing returns to scale over time. Because of these elements, early entrants can develop process innovations, sometimes much better than incumbents or latecomers. Early entrants can thus enjoy a leadership position in process innovation as, on the one hand, incumbents have to deal with other problems which are related to their large size and, on the other hand, latecomers have to concentrate on product innovation which allows them to grow to a minimum size in order to survive. The timing of entry is thus a major determinant in the formation of a competitive advantage over incumbents, as well as in long term survival over latecomers. This mechanism provides an alternative explanation of the shakeout.

The idea of a shakeout essentially driven by the evolution of technology over the course of the industry life cycle is thus progressively challenged by a new vision. The development, accumulation, diffusion and usage of competencies are thus key elements which drive the industry-life cycle and, as an outcome, involve a sensibly different vision of shakeout which is closer to the Marshallian tradition. Mueller (1990, 1997) shows that the long term viability of first movers is related in a large number of industries to specific features of demand (such as set-up and switching costs, network externalities of final users, inertia effects due to the customer's uncertainty on quality, inertia effects due to the customer's experience of existing products and services), as well as supply (such as set-up and network externalities of producers, economies of scale, cost-decreasing learning by using). Finally, Van Dijk (1998)

shows that increasing returns in R&D is not the major element in the first movers' competitiveness, but that network effects have a rather decisive effect.

Industry life cycle analyses generally focus on industries in which competition and innovation proceed from the interaction between firms (incumbents and entrants) within a given market, delimited by the purchases and sales of an homogenous product. On some occasions, however, vertical relationships between firms in the industry and their direct suppliers or customers have a strong impact on the evolution of industries. Innovation processes require the accumulation of complementary competencies, as well as an effective coordination between firms which generate these competencies. Since the industry is characterized by strong coordination between suppliers and producers, or producers and retailers, processes of entry and exit become industry-specific. Alternative life cycle patterns thus appear, eventually with non-shakeout phenomena. In some industries the emergence of specialized suppliers tends to re-dynamize the entry process in the phase of maturity. They develop new production processes, new specialized equipment, new technology at the upstream level and sell it to any downstream potential entrant who can pay the price. They significantly decrease barriers to entry and favor competition (Fransman, 1999; Krafft, 2010). In some cases, an industry was created by an initial inventor or an academic researcher who decided to set up a firm to exploit the commercial opportunities of his innovation. Many times, however, the production and distribution of this innovation required the contribution of other actors, usually larger firms. The coordination of competencies related to innovation on the one hand, and complementary competencies related to production and distribution on the other hand, strongly shaped the profile of evolution of the industry, and stimulated new entries (Bresnahan and Raff, 1991; Mitchell, 1995; Klepper, 1997).

The coordination of similar competencies is also an important topic for researchers interested in how innovations occur and their implications for firms and economic change. In some industries there is a somewhat paradoxical phenomenon that both small, specialized firms and large, diversified firms co-exist in the long run. Specific firms may come and go, and there are certainly mergers, alliances, and bankruptcies, but the two types of firms seem to an extent mutually dependent on each. This situation may lead to non-shakeout profiles of evolution, with small firms and large firms surviving over the long run. It seems important to combine such alliances with in-house R&D and competencies, because otherwise the firm has difficulties in evaluating the potential of new ideas and techniques that are developed outside the firm. In many cases, the intrinsic characteristics of knowledge in terms of codification and appropriability requires extended interaction, and explains why collaboration occurs amongst firms with similar competencies in order to stimulate innovation. But in the meantime, ownership and control rights are important to understand who has alliances with whom and are absolutely crucial in the evolution of the industry (Mc Kelvey, 1996; Saviotti, 1998).

Finally, the coherence that firms tend to develop in the coordination of similar and complementary competences tend to appear as a major issue in industrial dynamics. About some 20 years ago, Foss (1993) and Teece et al. (1994) claimed that coherence becomes a cognitive concept incorporating elements such as organizational learning within the firm, path-dependency characteristics, the depth and scope of technological opportunities in the neighbourhood of the firm's own technology and R&D activities, and the influence of the selection environment. Today, the notion of coherence tends to get an operational content in the industrial dynamics literature with the development of metrics on relatedness, proximity, similarity and interconnectedness and how they tend to evolve over time (Nooteboom, 2004; Krafft, Quatraro, Saviotti, 2011).

3.2. Industry dynamics and the nature of the firm

What conclusions can be drawn from this discussion of industry dynamics and life cycles with regard to the nature of the firm? As a preliminary comment, we can first think that technology essentially drives the life cycle of an industry, and is responsible for the shakeout. This calls to mind Schumpeter's vision of creative destruction in industrial dynamics. An entrepreneur sets up a firm to introduce an invention. This firm grows and holds a monopoly position for some time. But in time this firm is imitated by new entrants that eventually outperform the initial firm. This situation can continue until another entrepreneur develops a new project involving the exit of older and larger firms and the entry of new ones.

But we can also think about the shakeout in a different manner. We can consider that knowledge and competencies drive the life cycle of the industry. In that case, closer to Marshall's vision, the growth of knowledge is linked to the ability of firms to ensure coherence between internal economies (organization and direction of the resources of the firm) and external economies (general development of the economy, including the role of firms in the neighborhood). In this perspective, the shakeout affects firms differently, since some firms might have the opportunity to accumulate specific knowledge and competencies, and survive. In some cases non-shakeout patterns may thus emerge.

Beyond these background points about the relevance of earlier analysis to organisational as well as technical factors we can suggest that the diversity of the empirical evidence, and interpretations of this evidence, suggests that no single approach to the firm is relevant in all circumstances. Consider, first, a Schumpeter inspired analysis that life cycles are technologically driven with a key role played by the management of demand and supply side

uncertainties. To a large extent this can be mapped into, for example, a transaction cost analysis of the firm. The technological driver is essentially exogenous to organisational adaptation. The key role of uncertainty, and its link with large firm size, is also consistent with this perspective on the firm (Williamson, 1985). But now consider a Marshallian inspired analysis that emphasises the creation and management of knowledge. Here we can echo, for example, Barnard (1938) and suggest that the creation of new knowledge is endogenous to firm decisions and in terms of the economics of the firm we must account for change processes not just adaptation to exogenous technological changes. In addition Barnard is useful because he emphasises that firms are not long-lived. In terms of modern writing we can incorporate competence perspectives on the firm, as suggested above. We are not suggesting here that one approach (Schumpeter or Marshall) is universally relevant instead we prefer to suggest that the approaches are relevant in different circumstances.

Consider now what might be considered the key insight of empirically based studies of industry dynamic: the role of shakeout. Two key issues would appear to be appropriate here. First, the nature and type of competition changes pre- and post- any shakeout. Pre-shakeout intense competitive pressures result from firm entry and exit. Post-shakeout increased firm size and reduced entry/exit implies the emergence of oligopolistic structures with the complexity of strategic interdependence this implies. Arguably the economic-institutional aspects of this post-shakeout world have been under-analysed. Hence an oligopoly model that incorporates transaction costs is suggested below. The second issue we can take from the earlier shakeout discussion is that we cannot automatically link shakeout with technical progress because of the observed continuation of "old" technologies is some areas. This continuing relevance of old technologies suggests a non-adaptation to technological attractors

because of the dominance of process considerations. In an organisational context, this observation (once again) echoes Barnard's work.

Finally, in this section, we can consider the issue of the boundaries of the firm. If we accept the logic of an organisational life-cycle analysis firm boundaries can be analysed in terms of the dominance of driver, process or attractor effects, and so (once again) no single approach is likely to be relevant. In early life-cycle stages, with the dominance of technical and organisational drivers we can suggest that firm boundaries are based on the restructuring of institutional and technical knowledge linkages. In this context we can recognise the earlier discussion of the restructuring of vertical relations and hence the relevance of a Richardson (1972) based analysis of the firm and industry. When process considerations dominate firm activity we can suggest that firm boundaries are based on attempts to establish organizational and institutional rules. This establishment of rules will involve scale and scope effects along the lines suggested by Chandler (1977, 1990) and hence increasing firm size. Using earlier discussion we can suggest that this dominance of process, and the emergence of established rules, requires a shakeout of firm activity and hence limitation on entry and exit. But at the same time we should not over simplify the emergence of large firms, and expanding firm boundaries, because of the possible complementarity between small and large firms. Hence the established rules that govern organisational processes cover inter-firm as well as intra-firm activity. Finally, when attractors dominate firm development this will be a response to diffusing knowledge and rule stability in a post-shakeout world. In this context firm boundaries can be understood in the context of efficiency seeking behaviour.

4. A FORMAL MODEL OF REAL FIRMS

In the previous sections links have been created between the theory and the economics of the firm. The basic conclusion has been that no approach to the firm is uniquely dominant. In this section a different approach to creating theoretical linkages is developed in terms of a simple model of the firm. The basis of this modelling is the introduction of transaction cost features into an otherwise standard model of the firm. This would appear to be an appropriate mode of analysis for two reasons. First, there is a methodological consistency in the use of comparative statics (Dietrich, 1994). Secondly the assumption of economising on transaction costs is the dual of optimising behaviour.

4.1. A single firm

The simplicity of the modelling here is that all basic relationships are assumed linear, a feature that is commented on as the discussion proceeds. The discussion is presented in two stages. In this section a basic model for a single firm is developed. It is shown that predictions apparently consistent with some observations in the life-cycle literature are forthcoming. Following this a Cournot based duopoly analysis is presented. The objective here is to explore the idea suggested above that transaction cost economics may gain particular relevance in later life cycle stages that are characterised by relative knowledge stability and strategic interaction. But, once again, linkages are created to the life-cycle and other literatures.

The basic model involves a standard and simple, single product firm but introduces possible transaction cost effects into this. Obviously any firm undertakes many specific organisational tasks that cover the management of output markets, intra-firm activity and input markets. Following standard analysis we can think of these tasks in general terms as managing search,

negotiation and policing activities. To simplify technical detail we assume that these various managerial tasks are undertaken in fixed proportions with no substitution between organisational human and non-human inputs being possible. This simplification allows us to create an aggregate measure of transaction costs (C_T) that is simply the sum of the various specific organisational costs. We therefore have a single measure of managerial activity that can be applied in the different contexts. In addition this measure will be used as an indicator of organisation size rather than using real output as a measure of firm size.

In terms of a firm's demand for real output we assume the following linear form:

$$X = (a_0/a_1) - (1/a_1)p + (a_2/a_1)C_T \qquad [1a]$$

In [1a] X is output sold per period and p is selling price. The role of C_T here involves, for example, greater search and negotiation activity increasing output sold for any selling price. The linearity assumptions in [1a] are clearly not realistic for large changes in the variables but significantly simplify technical detail. It is more useful to re-write [1a] as an inverse demand function:

$$p = a_0 - a_1X + a_2C_T \qquad [1b]$$

In turn [1b] allows us to define a firm's total revenue:

$$TR = pX = a_0X - a_1X^2 + a_2C_T(X) \qquad [1c]$$

A firm's average production costs (AC_P) are modelled as follows:

$$AC_P = b_0 - b_1C_T > 0 \qquad [2a]$$

With given C_T formulation [2a] defines, of course, constant returns technology. The C_T effect can be thought of as either a more effective management of intra-firm activity affecting productivity and costs and/or more effective search, negotiation and policing in input markets. In [2a] it is clearly inappropriate to extrapolate beyond reasonable bounds, hence the

requirement that AC_P is positive. This requirement suggests an organisational capacity constraint:

$$C_T < b_0/b_1 \qquad [2b]$$

Using [2a] we can define a firm's total production costs (TC_P):

$$TC_P = b_0X - b_1C_T(X) \qquad [2c]$$

In turn we use [2c] to define a firm's total costs (TC):

$$TC = b_0X - b_1C_T(X) + C_T \qquad [2d]$$

Using [1c] and [2d] a firm's profit function is:

$$\pi = a_0X - a_1X^2 + a_2C_T(X) - [b_0X - b_1C_T(X) + C_T] \qquad [3a]$$

We can analyse [3a] in terms of short-run and long-run solutions. The short-run solution involves profit maximising with two choice variables X and C_T. Differentiating [3a] with respect to these variables and setting the derivatives equal to zero:

$$\partial\pi/\partial X = a_0 - 2a_1X + (a_2 + b_1)C_T - b_0 = 0 \qquad [3b]$$

$$\partial\pi/\partial C_T = (a_2 + b_1)X - 1 = 0 \qquad [3c]$$

Using [3b] we can define profit maximising output in terms of C_T:

$$X = \frac{a_0 - b_0}{2a_1} + \frac{a_2 + b_1}{2a_1}C_T \qquad [4a]$$

In [4a] the first element on the right hand side is a traditional short-run viability condition for firm activity. In the absence of transaction costs, the maximum price that can be charged (a_0) must be greater than exogenous unit costs (b_0) to generate positive output. But by introducing transaction costs this viability condition is amended. In the short-run (but not the long-run as considered below) positive output can be generated with $a_0 < b_0$ as long as C_T is sufficiently

large, an observation that allows us to create links, suggested below, between this model and life-cycle analysis.

To solve the system defined by [3b] and [3c] we substitute [4a] into [3c] and hence define optimal C_T:

$$C_T = \frac{2a_1}{(a_2 + b_1)^2} - \frac{a_0 - b_0}{a_2 + b_1} \qquad [4b]$$

The system defined by [4a] and [4b] presents a unique solution. Substituting [4b] into [4a]:

$$X = \frac{1}{a_2 + b_1} \qquad [4c]$$

The short-run solution implied by [4a]-[4c] can be analysed in the context of the life-cycle literature introduced above. Early in a life-cycle small firm entry and exit tends to be high. For successful firms profitability is high. Firm success, in terms of the current model, requires large $a_0 - b_0$ i.e. a large difference between maximum price and exogenous unit cost. From [4b], large $a_0 - b_0$ implies small C_T (ceteris paribus). So, early in a life-cycle, when profit opportunities are large, we can expect small organisational size. Another way of interpreting this result is that with $a_0 > b_0$ a firm is viable in the traditional economic sense and this reduces the requirement for organisational effort. But as a life-cycle proceeds market growth slows down. In terms of the current model this slowing can be interpreted as falling $a_0 - b_0$. In turn from [4b] this maturing life-cycle implies larger C_T (ceteris paribus) and so larger organisational size. Furthermore, equation [4b] says more than this. Markets that are unviable in the traditional sense, i.e. with $a_0 < b_0$, are short-run viable in our model as they generate large organisational effort and size. Short-run non-viability in our model is exogenous and produced by the organisational capacity constraint [2b]. If the large C_T predicted in [4b], because of possibly negative $a_0 - b_0$, is greater than the constraint defined in [4b] a firm may

experience short-run non-viability. In short the simple model developed here can predict an evolution of organisational size that is apparently consistent with life-cycle analysis.

One peculiarity of this model can be identified. While organisational size (C_T) varies with $a_0 - b_0$ in a way that is understandable, from [4c] it is clear that physical output (X) does not vary with $a_0 - b_0$. Actual output is determined by the interaction between C_T and revenue and cost determination, i.e. a_2 and b_1, but not directly by C_T. To some extent this is an interesting property of the model: physical output is determined by the interaction terms in the model and so indirectly by transaction cost rather than simply by profit potential. Intuitively, any profit potential requires appropriate organisational effort. But equally, one reason for this result is the linearity of the basic relationships in the model. With increasing organisational effectiveness as C_T increases, or with increasing physical returns to scale, we would not expect this result to hold.

The long-run solution to the model presented here to some extent, but not completely, qualifies the conclusions just drawn. Long-run firm viability requires non-negative profits. Re-writing [3a] and imposing this constraint:

$$\pi = (a_0 - b_0)X - a_1X^2 + [(a_2 + b_1)X - 1]C_T > 0 \qquad [3a']$$

Using [4c], i.e. the condition for profit maximising output, it is clear that $[a_2 + b_1]X$ is always unity if we impose profit maximisation. Hence the non-negativity of profit in [3a'] depends on $(a_0 - b_0)X - a_1X^2$. It follows that long-run firm viability requires $a_0 > b_0$, as we would expect in a non transaction cost model. An implication here is that in our simple model transaction costs have a short-run but not long-run impact on firm viability and activity. But once non-negative profits are earned the organisational size effects discussed above are relevant.

One final point is appropriate in this discussion. We have interpreted the single firm model in terms of possible life-cycle effects. But an alternative, and perhaps more standard, interpretation is possible. Competitive market analysis suggests that firm entry occurs with positive profitability, in the absence of entry and exit barriers. In this context our model can be viewed as a developed monopolistically competitive firm. Successful firm entry will reduce the market shares of existing firms. In terms of our simple model successful firm entry reduces a_0. Firm entry will therefore eventually impose a non-negative profit constraint as in [3a']. The possible effects here are illustrated in Table 1.1 that shows the impact of changing a_0 for particular parameter values.

Table 1.1 here

Impact of changing a_0

As we move from left to right across the columns of Table 1.1 we see the impact of declining a_0 interpreted as either a maturing life cycle or greater competition from firm entry. We can see the unchanged physical output, a feature already discussed. More importantly we see increasing organisational size (C_T) and declining profitability. If we interpret changing a_0 as a response to firm entry the change in C_T warrants discussion. With traditional monopolistic competition a movement to long-run equilibrium resulting from firm entry produces excess capacity. The latter, in turn, may introduce an incentive for larger firm size, perhaps via merger, to eliminate the excess capacity. In the model developed here we see larger organisational size emerging with greater competition but this is not because of excess capacity. It is due to the interaction between transaction costs and firm revenue and costs. Intuitively, greater competition generates greater profit seeking incentives that require larger

transaction costs and hence organisational size. In the comparative static model developed here this process has a long-run equilibrium with zero profits being earned. This long-run solution is clear in Table 1.1. This long-run constraint on firm size occurs even though we have exogenous constant returns to scale. Hence the constraint is produced by the interaction between the economics and theory of the firm.

4.2. A duopoly model of real firms

In this section the discussion of the firm just presented is further developed in terms of a Cournot based duopoly analysis. The objectives here are twofold. First we further explore linkages between the economics and theory of the firm. Secondly we develop the idea that transaction cost economics may gain particular relevance in later life cycle stages that are characterised by relative knowledge stability and strategic interaction.

The basic structure of the analysis is the same as that used above except that we have two firms. The inverse demand functions are:

$$p_1 = a_0 - a_1X_1 - a_2X_2 + a_3C_{T1} \qquad [5a]$$

$$p_2 = a_0 - a_1X_2 - a_2X_1 + a_3C_{T2} \qquad [5b]$$

Note the following features here. The two demand functions have identical parameters. In principle this is unnecessary but simplifies technical detail. The two firms have individual prices because of individual organisational efforts (C_{T1} and C_{T2}) and because of potential product differentiation when a_1 and a_2 are not equal. The issue of potential product differentiation is important in this model and will be discussed further below. But even though there are individual prices in [5a] and [5b] in a Cournot equilibrium prices will be the same because of identical parameters and cost functions (as detailed below). X_2 has an impact on p_1, in turn C_{T2} impacts on X_2 hence there is an indirect effect of C_{T2} on p_1 but in [5a] there

is no direct effect. Similarly there is an indirect impact of C_{T1} on p_2 but no direct impact. Using [5a] and [5b] we can define firm total revenues:

$$TR_1 = p_1X_1 = a_0X_1 - a_1X_1^2 - a_2X_1X_2 + a_3C_{T1}X_1 \qquad [5c]$$

$$TR_2 = p_2X_2 = a_0X_2 - a_1X_2^2 - a_2X_1X_2 + a_3C_{T2}X_2 \qquad [5c]$$

Firm costs are structured in the same way as in the previous section. Average production costs are:

$$AC_{P1} = b_0 - b_1C_{T1} > 0 \qquad [6a]$$

$$AC_{P2} = b_0 - b_1C_{T2} > 0 \qquad [6b]$$

There is the same requirement for organisational capacity constraints:

$$C_{T1}, C_{T2} < b_0/b_1 \qquad [6c]$$

Total costs are:

$$TC_1 = b_0X_1 - b_1C_{T1}X_1 + C_{T1} \qquad [6d]$$

$$TC_2 = b_0X_2 - b_1C_{T2}X_2 + C_{T2} \qquad [6e]$$

Firm profits are:

$$\pi_1 = a_0X_1 - a_1X_1^2 - a_2X_1X_2 + a_3C_{T1}X_1 - [b_0X_1 - b_1C_{T1}X_1 + C_{T1}] \qquad [7a]$$

$$\pi_2 = a_0X_2 - a_1X_2^2 - a_2X_1X_2 + a_3C_{T2}X_2 - [b_0X_2 - b_1C_{T2}X_2 + C_{T2}] \qquad [7b]$$

As above we have two choice variables for each firm (output and transaction costs) but in addition we have the added complexity of the strategic interaction of the firms. The relevant first order conditions are:

$$\partial\pi_1/\partial X_1 = a_0 - 2a_1X_1 - a_2X_2 + a_3C_{T1} - b_0 + b_1C_{T1} = 0 \qquad [8a]$$

$$\partial\pi_1/\partial C_{T1} = (a_3 + b_1)X_1 - 1 = 0 \qquad [8b]$$

$$\partial\pi_2/\partial X_2 = a_0 - 2a_1X_2 - a_2X_1 + a_3C_{T2} - b_0 + b_1C_{T2} = 0 \qquad [8c]$$

$$\partial\pi_2/\partial C_{T2} = (a_3 + b_1)X_2 - 1 = 0 \qquad [8d]$$

[8a]-[8d] can be solved in an equivalent manner to that used above but the strategic interaction renders the solution more complex. We use [8a] and [8c] to define profit maximising outputs:

$$X_1 = \frac{a_0 - b_0}{2a_1} + \frac{a_3 + b_1}{2a_1} C_{T1} - \frac{a_2}{2a_1} X_2 \qquad [9a]$$

$$X_2 = \frac{a_0 - b_0}{2a_1} + \frac{a_3 + b_1}{2a_1} C_{T2} - \frac{a_2}{2a_1} X_1 \qquad [9b]$$

[9a] and [9b] define output reaction functions for the two firms but with the addition of own firm transaction cost effects on output. Solving [9a] and [9b] simultaneously defines equilibrium firm outputs in terms of both firm transaction costs:

$$X_1 = \frac{(2a_1 - a_2)(a_0 - b_0)}{(2a_1)^2 - (a_2)^2} + \frac{2a_1(a_3 + b_1)}{(2a_1)^2 - (a_2)^2} C_{T1} - \frac{a_2(a_3 + b_1)}{(2a_1)^2 - (a_2)^2} C_{T2} \qquad [9c]$$

$$X_2 = \frac{(2a_1 - a_2)(a_0 - b_0)}{(2a_1)^2 - (a_2)^2} + \frac{2a_1(a_3 + b_1)}{(2a_1)^2 - (a_2)^2} C_{T2} - \frac{a_2(a_3 + b_1)}{(2a_1)^2 - (a_2)^2} C_{T1} \qquad [9d]$$

Substituting [9c] into [8b] and [9d] into [8d] defines transaction cost reaction functions for the two firms:

$$C_{T1} = \frac{(2a_1)^2 - (a_2)^2 - (a_3 + b_1)(2a_1 - a_2)(a_0 - b_0)}{2a_1(a_3 + b_1)^2} + \frac{a_2}{2a_1} C_{T2} \qquad [9e]$$

$$C_{T2} = \frac{(2a_1)^2 - (a_2)^2 - (a_3 + b_1)(2a_1 - a_2)(a_0 - b_0)}{2a_1(a_3 + b_1)^2} + \frac{a_2}{2a_1} C_{T1} \qquad [9f]$$

Discussion of [9e] and [9f] is undertaken in the context of Figure 1.1. In both the left and right hand parts of the diagram RF_1 and RF_2 are the two reaction functions that refer to respectively [9e] and [9f]. The first point to note about the reaction functions is their positive slope defined by $a_2/2a_1$. We will comment shortly on possible implications here. If we assume, for the moment, a follower-follower analysis equilibrium transaction costs exist where the reaction function intersect at some positive transaction costs for both firms. In the left hand diagram

the positive intercept implies that firms can exist. In the right hand diagram the non-positive intercept implies there is no equilibrium with positive firm size and so the two firms cannot exist.

Figure 1.1 here

Transaction Cost Reaction Functions

The difference between the two parts of Figure 1.1 is summarised in terms of the relative sizes of a_1 and a_2. To see the logic here we can observe from [9e] and [9f] that the denominator of the intercept must be positive. It follows that the intercept difference shown in the two sides of Figure 1.1 depends on the numerator. Using [9e] or [9f] the left hand diagram requires:

$$\frac{(2a_1)^2 - (a_2)^2}{2a_1 - a_2} > (a_3 + b_1)(a_0 - b_0) \qquad [9g]$$

To understand the implications of [9g] we can first use earlier discussion and observe that long-run firm viability requires $a_0 > b_0$. We will not reproduce here the discussion of short-run viability with large transaction costs and $a_0 < b_0$ and instead assume long-run non-negative profits. It follows that a necessary condition for the relevance of the left hand diagram, and hence the possible existence of firms, is that the left hand side of [9g] is positive. This latter condition is only possible with $a_1 > a_2$ as stated in the diagram.

We can offer an intuitive explanation of the existence of firms requiring $a_1 > a_2$ in the following way. Referring back to the demand functions [5a] and [5b] $a_1 > a_2$ implies that product differentiation exists. With product homogeneity $a_1 = a_2$ hence the left hand side of [9g] is zero with the implication that the existence of firms requires that the right hand side of [9g] is negative. The latter is not possible if we assume non-negative long-run profits. This

importance of product differentiation can be explained in the following terms. The benefits of transaction cost expenditures on demand must be realisable as increased profitability. With product homogeneity such expenditures can be viewed as public goods with the benefits accruing to all firms rather than the individual firms undertaking the expenditures.

This reasoning suggests a strategic motive for the existence of firms. It is perhaps relevant to cite earlier discussion of Williamson's view that strategizing is unimportant for the firm. But the discussion here, by linking the economics of the firm and the theory of the firm comes to a somewhat different conclusion. The interpretation offered here of the left hand side of Figure 1.1 is more consistent with the neo-Austrian dynamic transaction cost literature or the dynamic competence literature. The organisational expenditures required to promote long-run progress must promote long-run profitability. In these literatures the link between expenditures and profits is based on such factors as first mover advantages, tacit knowledge etc. Given the formal logic used here an equivalent link requires product differentiation. But a strict equivalence between dynamic approaches to the firm and the strategic perspective offered here cannot be taken too far. There are two obvious differences: (a) a comparative static equilibrium analysis rather than process reasoning and (b) the assumption here of a follower-follower model that is not obviously consistent with entrepreneurship and dynamic firm leadership. Difference (a) is a fundamental characteristic of the methodologies but difference (b) can be accommodated, to some extent, by moving beyond a follower-follower framework as suggested below.

Before considering a transaction cost leader-follower framework a few remaining issues can be taken up. First, as with earlier discussion we can create a link between the analysis presented here and earlier discussion of life-cycle models. Earlier discussion emphasised that

as a life cycle matures there is a shift from process to product innovation. This reasoning therefore implies increased product differentiation as life cycles mature. In terms of [9e] and [9f] and the left hand side of Figure 1.1 increased product differentiation implies increased intercept and slope of the reaction functions. In turn these changes suggest an increase in equilibrium transaction costs i.e. an increase in firm size. Intuitively, increased product differentiation increases returns to transaction cost expenditures. The resulting change in firm size is also emphasised in life cycle analysis. Hence the strategic transaction cost model presented here has an important connection with the empirically based life cycle analysis.

The second issue that can be briefly explored concerns the notion of transaction cost economising, an important principle of conventional (non-strategic) transaction cost analysis (Williamson, 1985). The problems here can be considered in the context of the left hand side of Figure 1.1. If, for example, the second firm does not exist i.e. $C_{T2}=0$ we have a single firm analysis as considered earlier. In the diagram setting $C_{T2}=0$ suggests that profit maximising C_{T1} is where RF_1 cuts the horizontal X axis; this is the single firm (non-strategic) solution. The addition of the second firm increases firm and industry transaction costs. In short we cannot assume that competition automatically reduces transaction costs when we take account of the links between the economics of the firm and the theory of the firm.

The third issue concerns the final part of the strategic solution. The details of the algebra are unnecessary here given the nature of the current discussion. But intuitively the solution is straightforward. From the left hand side of Figure 1.1 profit maximising equilibrium transaction costs are defined for both firms where RF_1 and RF_2 intersect. These C_{T1} and C_{T2} can be substituted into [9c] and [9d] to define firm output levels. Hence the system can be solved. For illustrative purposes we can use an equivalent parameterisation to that used above:

a_0=5, a_1=0.5, a_2=0.1, a_3=0.1, b_0=1, b_1=0.1. Given these values we can specify the transaction cost reaction functions. Using [9e] and [9f]:

$$C_{T1} = 6.75 + 0.1C_{T2} \qquad [9e']$$

$$C_{T2} = 6.75 + 0.1C_{T1} \qquad [9f']$$

Solving the simultaneous equations: $C_{T1} = C_{T2} = 7.5$. Using these equilibrium transaction costs in [9c] and [9d]:

$$X_1 = X_2 = 3.636 + 0.202*7.5 - 0.020*7.5 = 5 \qquad [9c']$$

Hence, using [7a] and [7b], firm profits are: $\pi_1 = \pi_2 = 5$.

This solution can be used as a stepping stone to one final aspect of the discussion. Earlier the strategic perspective suggested here was linked, with qualifications, to competence and entrepreneurial approaches to the firm. One qualification involved the follower-follower framework underlying Figure 1.1. While this framework has facilitated the development of useful insights it is straightforward to extend it to cover the possibility of firm organisational leadership. Intuitively a leader firm can use its transaction cost decisions to influence a follower firm. It is most straightforward to do this using the parameterisation just adopted. In addition we will assume firm one is the leader. We can solve the leader-follower model in a somewhat standard manner. In terms of abstract theory firm one uses firm two transaction cost and output reaction functions to predict responses to firm one behaviour. This is solved in the standard way by substituting the reaction functions into firm one's profit function. Using parameter values we can re-write the profit function [7a]

$$\pi_1 = 5X_1 - 0.5X_1^2 - 0.1X_1X_2 + 0.1C_{T1}X_1 - [X_1 - 0.1C_{T1}X_1 + C_{T1}] \qquad [7a']$$

Using parameter values along with [9d] we substitute for X_2 in [7a']. In addition we use [9f'] to substitute for C_{T2}. After simplification the leader's profit function is then:

$$\pi_1 = 3.65X_1 - 0.5X_1^2 + 0.2C_{T1}X_1 - C_{T1} \qquad [7a'']$$

Formulation [7a''] is solved as a single firm model using the method discussed above.

$$\frac{\partial \pi_1}{\partial X_1} = 3.65 - X_1 + 0.2C_{T1} = 0 \qquad [10a]$$

$$\frac{\partial \pi_1}{\partial TC_1} = 0.2X_1 - 1 = 0 \qquad [10b]$$

The solution suggests that $C_{T1} = 6.75$ and using firm two's reaction function [9f'] $C_{T2} = 7.45$. These transaction cost levels are compared to 7.5 in the follower-follower version of the model. Because of the parameterisation used here the leader firm sets transaction costs as if it is a monopolist, at a level that would occur if $C_{T2} = 0$: see [9e']. This leader-follower solution is depicted in Figure 1.2. Although it is based on a specific parameterisation the resulting order of change shown in the diagram is a generalisable result. The strategic leadership involves a reduction in transaction costs for both firms but particularly for the leader firm. The leader firm can economise on transaction costs knowing that the follower firm will simply react to this. The leader firm basically exploits the reactions of the follower firm, an aspect of transaction cost economics that is apparently lacking in the literature. The leader-follower analysis suggested here is closer to the internalisation transaction cost literature (as surveyed in chapter X of this volume) used to analyse multinational companies. The internalisation decision can be viewed as an act of strategic leadership, to exploit unique firm advantages, that economises on organisational costs.

Figure 1.2 here

Transaction Cost Leader –Follower Solution

Continuing with the leader-follower solution, using the output reaction functions we find that $X_1 = X_2 = 5$. This invariance of firm outputs is based on the characteristics of the model and

parameterisation used here as discussed earlier. The profit for firm one is (using [7a''']) 5.75 i.e. as we would expect strategic leadership increases profits. For the follower firm we use firm two's profit function with the assumed parameter values and find $\pi_2 = 5$ i.e. the follower is no worse off. This latter result is a consequence of the parameterisation and the assumed linearity of the model. Hence it is not a generalisable result.

5. OUTLINE OF THE VOLUME

The rest of this volume is organised as follows. In Part II there are a number of shorter "background" essays. The intention here is to present brief surveys of key founding writers on the firm. The writers covered are not intended to present an exhaustive historical survey, as this would involve a Handbook in its own right, instead the intention is to link the work of founding writers on the firm to modern understanding. The essays in the other six parts are intended to cover longer surveys of important topics on the theory and economics of the firm. Part III considers equilibrium and new institutional theories. Note that the topics covered here are guided by already existing Handbooks, or equivalent, published by Edward Elgar. These already existing volumes cover in a comprehensive manner transaction cost and more generally new institutional theory. But in many of the chapters in the current volume the obvious importance of transaction costs is reflected in the discussion in a more applied way. For the same reasons there is no single chapter on entrepreneurship. The essay on agency theory and firm governance (chapter 11) could have equally appeared in part IV as a "modern issue" but the balance of the contents suggested the current position. The same logic applies to chapter 12 on hybrid governance. While this is usually considered a topic in transaction cost economics, as reflected in the current chapter, it is also a key "modern issues" topic that

reflects the overall emphasis here of bridge building between the economics and theory of the firm. Finally in part III, chapter 13 is included because it reflects a gap in many discussions of the economics of the firm. Consideration of the transaction cost empirical work recognises the importance of the bridge building suggested here.

Part IV of the volume includes four essays on the multinational firm. This reflects the importance of this topic as a key modern issue. But the balance of the volume suggests a separate section on this topic rather than an overly long part VI. In addition to a contextual discussion (chapter 14) there is a review of internalisation theory (chapter 15) and also consideration of how the institutional contexts of Japan and Europe have affected the firm (chapter 16 and 17). Part V surveys various topics under the general heading of dynamic approaches to the firm: Edith Penrose and George Richardson (chapter 18); Nelson and Winter revisited (chapter 19); modern resource-based theory(ies) (chapter 20); and the cognitive theory of the firm (chapter 21). The way in which these chapters are linked into the overall philosophy of this volume should be clear from earlier discussion in this introductory chapter.

Parts IV and VII cover twelve chapters on what are called “modern issues” and “firm strategies”. These two parts reflect the earlier suggestion that that the potential complexity of real firms, involving the interaction between the economics and theory of the firm, can be rendered tractable by considering particular issues and strategies. In part IV there are discussions that revisit Chandler (chapter 22); consider the topic of financialisation and the firm (chapter 23); the analysis of firm growth (chapter 24); corporate governance again (chapter 25) but this time in the particular context of innovation and executive pay; innovation platforms and the knowledge intensive firm (chapter 26); and small firms (chapter 27). In part

VII the various firm strategies covered are mergers and acquisitions (chapter 28); R&D and the firm (chapter 29); vertical relationships in the context of novelty (chapter 30); product innovation (chapter 31); modularity (chapter 32); and innovation networks (chapter 33).

The final section of the volume reflects the view suggested above that real firms do not constitute a closed system. The chapters in part VIII open the analysis of real firms to the topic of economic policy. Here the five essays cover cartel and monopoly policy (chapter 34); R&D and industrial policy (chapter 35); entrepreneurship and policy (chapter 36); regulation and networks (chapter 37); and venture capitalism (chapter 38). To reiterate earlier discussion, the various chapters are collectively intended to create bridges between the economics and theory of the firm and so reflect an important development in firm analysis.

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