

3. What do firms learn? Capabilities, distribution and the division of labour¹

Paolo Ramazzotti

INTRODUCTION

The aim of this chapter is to investigate the relation between the learning processes of firms and their industrial specialization.² Its point of departure is recent research in the theory of the firm – namely the capabilities- (or competence-) based approach³ – which has stressed how codified and tacit knowledge jointly account for the existence of differences in individual and organizational capabilities within and among firms. Following this approach, the variety of capabilities accounts for inter- and intra-firm division of labour so that specialization – the activities that a firm becomes fit to carry out – would seem to be an almost natural outcome.

The capabilities approach raises a range of issues, which will be discussed in the sections that follow. First, despite the many insights that the approach has provided, there still are some problems in defining and appropriately accounting for the origin of capabilities as well as in understanding the key features of the division of labour. Capabilities are often assumed to exist a priori or they are claimed to be part of an ongoing, yet not adequately outlined, process. As for the division of labour, it is treated as a technical issue rather than as a strategic variable. The chapter contends that this approach is unsatisfactory and it stresses that capabilities depend on the division of labour that management devises (see: ‘Whence capabilities?’, below).

A related set of issues focuses on the function that the division of labour may have. The chapter argues that it may be devised in order to achieve cost-effectiveness, to enhance and direct learning processes and to affect bargaining power among the parties concerned. Which function is given priority depends on the strategic outlook of management, thus on how management positions the firm on the market and how it organizes the available capabilities and arranges the required learning processes. In this

regard, the chapter discusses the manifold nature and the requirements that knowledge – thus the capabilities – of the workers has to meet in order to be consistent with management’s strategic outlook. Two major problems may arise. First, misperception of management’s strategic outlook may prevent workers from effectively taking part in the overall problem-solving activity of the firm. Second, inconsistent values – for example, different views concerning distribution – may give rise to cognitive dissonance and undermine the firm as an organization. While the first problem may require an extension of the knowledge workers have access to, the second one may require a restriction of that knowledge. In the latter case, the relevance of the division of labour, from the point of view of management, is that it affects the bargaining power of workers (see: ‘Capabilities and knowledge creation’, below).

The division of labour and the resulting capabilities affect the pattern of specialization of the firm, which feeds back on the strategy pursued. Two alternative patterns may be envisaged. If, for whatever circumstance, management focuses on qualitative competitiveness and leaves distribution – within the firm or within the industry’s value chain – unaffected, then the parties concerned are more likely to share the firm’s strategic outlook. A division of labour may be devised to solve problems associated with qualitative competitiveness and, in so far as such a goal is achieved, the value added accruing to the firm – and to the value chain – will rise and distribution will remain a minor issue. Alternatively, if management focuses on distribution, conflicts of interest may force it to devise a division of labour that assures loyalty at the expense of problem solving. Under these circumstances, value added may not grow much, thereby leading to cost stripping as the only way to ensure short-run profitability (see: ‘Distribution, learning and specialization’, below).

The self-reinforcing patterns here outlined may help to provide an account for actual divergences in the patterns of specialization at the regional and country – as well as firm – levels. Because of the implications this may have for overall growth patterns, the conclusive remarks point to a few policy-related issues.

WHENCE CAPABILITIES?

Capabilities and the Division of Labour

In a famous paper, Richardson defined capabilities as ‘knowledge, experience and skills’ (Richardson [1972] 1990, p. 231). He acknowledged: ‘The notion of capability is somewhat vague, but no more so perhaps than that

of, say, liquidity and, I believe, no less useful' (ibid.). Although the notion has been elaborated upon by subsequent research, it does remain 'some-what vague'.⁴ There are two reasons for this. The first one is that it is fairly common for scholars who investigate an emerging field of inquiry to label the same concepts in different ways, thereby leading to a somewhat fuzzy situation.⁵ The second reason is that, much like in the case of liquidity, there is something in the notion of capability that is irreducible to a regularity. Capabilities are what is required to solve problems as they arise. Depending on the nature of the problem, a solution may be sought by resorting to logical deduction or to heuristics, to 'know that' or to 'know how', to tacit knowledge or to codified knowledge. Independently of how it is sought, a solution to a problem implies a learning process. Thus, the difficulties in appropriately defining capabilities presumably arise because of the manifold nature of problem-solving activities (Dosi and Egidi 1991). In this section, I shall elaborate on this issue by arguing that capabilities co-evolve with those activities by means of the division of labour.

We do know that each individual has distinct knowledge, experience and skills (Minsky 1985). This means that he/she has distinct capabilities, which differ from those that others have. Furthermore, bounded rationality and incomplete and scattered information imply that no single individual can solve all problems. A single problem may be too large to tackle by a single individual, so that it has to be split up into subproblems, each one of which will be assigned to distinct individuals.

The nature of the problems that agents have to cope with varies. It may consist in executing a detailed procedure,⁶ in learning how to do something, in learning how to learn. A learning process generally occurs even when the most trivial tasks have to be carried out. When Adam Smith stressed the importance of the division of labour, he focused on how specialization in pin manufacturing would favour the identification, and possible introduction, of improvements in fairly trivial tasks.

The division of labour within a firm consists in the assignment of a set of tasks to individuals who presumably have the capabilities to carry them out. It therefore defines the subproblems each individual will have to cope with, thus also the boundaries of the environment he/she will have to focus on. This entails that each individual knows only a part of what is required to solve the problem, while the team as a whole has the knowledge required for the solution (Nelson and Winter 1982; Egidi 1992). The division of labour is, in this sense, the link between individual and organizational capabilities. In a more dynamic perspective, the above boundaries define the knowledge required to carry out the task but also guidelines for future learning processes.⁷ Consequently, individual capabilities at any given moment result from the evolution of original individual capabilities and the

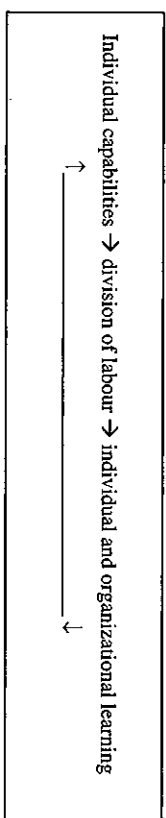


Figure 3.1 The division of labour and learning

nature of that evolution depends on the learning potential that the division of labour assigned to each individual. Organizational capabilities reflect these circumstances. The feedback process outlined is summarized by Figure 3.1.

Just as tasks may be assigned to individuals within a firm, they may be assigned to distinct firms within an industry, or to distinct industries. I introduce this topic in the subsection that follows. Subsequently, I shall discuss who determines the division of labour and on what grounds.

Coordination and the Division of Labour

By definition, the division of labour implies complementarities between distinct tasks, or activities. In turn, complementarities require some sort of coordination. Richardson ([1972] 1990) investigated distinct forms of coordination – direction, cooperation and market transactions – in relation to the technical characteristics of activities, namely similarity and the degree of complementarity. In particular, he argued that activities are 'similar' when they require the same capabilities; they are 'closely complementary' when they belong to different phases of a given production process so that they require *ex ante* interaction between the parties involved. Consequently, capabilities have to be shared either when activities are similar or when they are dissimilar but they interlock tightly. What this leads to is that the coordination issue deals with the inter-firm division of labour, that is, whether tasks are carried out within a firm or are left for other agents to carry out, and it depends on the technical characteristics of capabilities. This conclusion is clearly pointed out by Langlois and Foss: 'Richardson's insight is a simple but extremely profound one. For it suggests that – as a quite general matter – capabilities are determinants of the boundaries of the firm' (Langlois and Foss 1999, p. 209).

The above conclusion raises a range of important issues. First, is it exhaustive? Capabilities may exist that are not profitable. In such a case it would be pointless to claim that they determine the boundaries of the firm. It is therefore appropriate to refer to a more specific bundle of capabilities:

those that are consistent with an expected rate of profit. The capabilities in this bundle determine what Teece (1988) names 'core business'.⁸ However, as Dosi et al. (1992) and Dosi (1994) argue, a given set of core capabilities may be compatible with different boundaries. While a minimum bundle of capabilities is required for a firm to exist, the bundle that actually exists within a firm may well be larger, including a range of additional capabilities that favour complementary activities. Under these circumstances it is not clear that 'capabilities are determinants of the boundaries of the firm'. Core capabilities are more likely to be mere constraints. At the very least some co-determinants must be identified. This is precisely what Dosi et al. (1992) do. We shall return to them shortly.

The second issue concerns the causal relation between capabilities and coordination. The claim that coordination (the boundaries of the firm) depends on capabilities needs to be qualified. If capabilities are assumed to be exogenous, the claim is consistent. While this may be the case, to some extent, for individual capabilities, it is not when organizational capabilities are taken into account. The latter result from a division of labour within organizations/firms, which, in turn, arises only if and when the coordination problem is solved, that is, when the boundaries of the firms are appropriately defined.

A more appropriate way to explain the relation between capabilities and coordination is to assume the following recursive process. Consider an initial situation where employers resort to individual capabilities and determine a division of labour within their firms. This situation allows organizational capabilities to arise, whereby firms learn how to cope with problems they could not tackle before. This means that firms learn how to deal with complementarities, including how to change them. As a result, new capabilities, both individual and organizational, determine a reassessment of the coordination problem. The (new) boundaries of the firms allow a new internal division of labour to be determined. The process is depicted in Figure 3.2. What it suggests is that boundaries are determinants of the capabilities of the firm just as 'capabilities are determinants of the boundaries of the firm'.

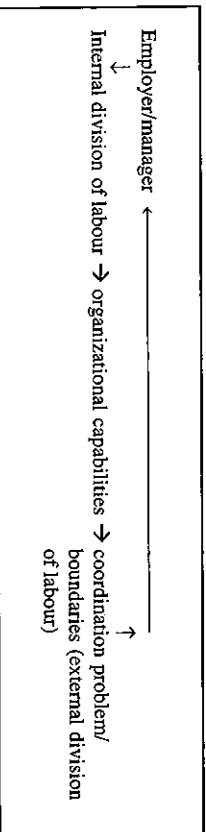


Figure 3.2 Coordination and organizational capabilities

The account Dosi et al. (1992) provide of 'coherent' boundaries seems to imply the existence of such a recursive process. Furthermore, they explain what determines the boundaries of firms by introducing a range of co-determinants of the firm's learning process: path-dependence, the technological environment, selection and so on. What they do not seem to be concerned with is what employers/managers pursue, thus the degrees of freedom that firms have and how these may affect the process depicted in Figure 3.2. The behaviour of a firm apparently consists in passive adaptation to the requirements of a given external environment. This restrictive view is criticized by Nelson, who comments:⁹ 'Absent a reasonably coherent and accepted strategy . . . [there is no real guidance regarding the capabilities a firm needs to protect, enhance, or add in order to be effective in the next round of innovative competition]' (Nelson 1991, p. 69).¹⁰

The notion of strategy as mere adaptation is extremely restrictive in a world where, owing to incomplete and scattered information and bounded rationality, agents have to procedurally choose how to carry out their activities (Simon 1976; Dosi and Egidì 1991). Under these circumstances they have to make some sense of the environment they act in and choose a set of actions that, in their view, will consistently achieve the pursued goal. Depending on how and what they learn about what is going on, they will identify one out of many possible strategies. The third issue qualifies the previous one in that it is concerned with how the (internal) division of labour¹¹ is devised. Teece's notion of core competences entails a hierarchy of capabilities in terms of a firm's competitiveness. Egidì argues that the 'process of problem solving by division into independent sub-problems seems to suggest that the existence of hierarchies in organizations may be intrinsic to the method of solving problems' (Egidì 1992, p. 168). In Egidì's framework, the capabilities of the agent who decomposes the main problem presumably lie at the top. What remains to be assessed is how he/she decomposes the problem, thereby arranging all the other capabilities available: what is at issue is how tasks and routines are devised.

This issue would be irrelevant if only one division of labour were available. This is not the general case, however. As Egidì (1992, p. 168) argues, 'it should be emphasized that there is usually more than one way of decomposing a problem, and that there are therefore an equal number of possible hierarchies'. In other terms, different types of division of labour are possible. Under these circumstances, the division of labour turns out to be a co-determinant of – rather than a mere technological constraint to – the boundaries of the firm.

Following the above discussion, capabilities result from a process originated by the division of labour. Thus, they can be understood only through

an inquiry into what determines the choice among different types of division of labour. This implies the discussion of three issues. The first one is who decides what division of labour is required. The second is what rationale underlies the decisions. The third is whether and how distinct capabilities and activities are likely to be consistent with that rationale.

In a decentralized economy decisions about what activity to carry out are taken by single firms. Thus, as far as the first issue is concerned, I assume that the specific agent who decides is a firm's management. In particular, I conceive of management as the (collective) agent who: conjectures an appropriate decomposition of a broadly defined economic problem (for example, making profits); identifies the capabilities to cope with each sub-problem; and, combines them in order to achieve a solution.¹² In order to focus on the specific issues I pointed out above, I shall assume that no conflicts exist within the management of a firm.¹³

In the section that follows I shall focus on the second issue. In particular, I shall discuss the functions that the division of labour may have in relation to the strategic outlook of management. I shall stress why knowledge is a key issue in this regard, and then point to the division of labour as a knowledge-creating device.

CAPABILITIES AND KNOWLEDGE CREATION

Profits, the Division of Labour and Strategy

In order to understand what underlies the behaviour of a firm's management, it is important to identify the goal the latter pursues. In the above section I pointed out that capabilities may be hierarchically arranged in terms of the goals pursued and I mentioned two possible goals. The first one concerns problem solving. Its generality is such that it may be applied to basically any kind of problem, economic or not. Precisely because it is so general, there is a risk that any inconsistency between, say, technical and economic problems may be missed or inadequately appreciated. The second goal, on the contrary, is competitiveness. It is much more specific, so much so that it need not even be the prime goal a firm pursues: the claim that profitability is impossible without competitiveness may be open to debate, whereas it is fairly clear that competitiveness would be pointless if it did not achieve profitability.

Following a widespread tradition that goes back to Karl Marx, Thorstein Veblen, Joseph Schumpeter and John Maynard Keynes, I assume that the main goal that management pursues – thus the main problem it has to face – is (money) profitability. Profits may be made in a variety of ways

and production of real output is only one of them.¹⁴ As I shall contend in this and the next section ('Distribution, learning and specialization'), this implies that not all the parties involved in the profit-seeking process need gain from it. In some instances such a process may resemble a zero-sum or even a negative-sum game. Management has to decompose the profit goal/problem into a range of subgoals/problems, which may be further decomposed into second-, third- and so on, order subgoals/problems. Each department or individual involved in this problem-solving hierarchical arrangement will end up pursuing the solution to a specific subproblem. Depending on the priorities assigned, thus to what problems are in the higher tiers of the hierarchy, a specific intra- and inter-firm division of labour will ensue.

Leaving aside the influence of external factors, three elements are crucial in the choice of the appropriate division of labour. The first one is cost-effectiveness: assuming a given type of product, unit costs will depend on how production is organized. At any given moment this may be viewed as a problem of static efficiency. As Leijonhufvud points out, however, these elements should be viewed in terms of an evolutionary process. Drawing on Adam Smith and Marx, he stresses that: 'As one subdivides the process of production vertically into a greater and greater number of simpler and simpler tasks, some of these tasks become so simple that a *machine* could do them' (Leijonhufvud 1986, p. 215; emphasis in the original). Thus, the enactment of a division of labour eventually determines a reshuffling or reassessment of the capabilities required by the firm (see Figure 3.2).

The second element, which also draws on Smith, is learning. The relative importance assigned to a capability by a given division of labour implies that it will be greatly resorted to and that learning specifically associated to its use will be enhanced (Levitt and March 1988; Loasby 1991, 1999). Consequently, the division of labour, by determining a specific hierarchy among capabilities, affects the nature and the availability of future capabilities. It determines the weight each single capability has in the learning process depicted by Figure 3.1.¹⁵

This leads us to the third element: bargaining power. The existence of hierarchies in the capabilities used implies that a relatively more important capability increases the influence of the agent who possesses it (Marglin 1974). While this may lead to an efficient outcome – *in terms of the subgoal* pursued – it may also determine what is commonly known as an incentive compatibility problem, that is, an inefficient outcome *in terms of the main goal*. The actual availability of capabilities and the related hold-up problems may eventually lead to a reassessment of the coordination issue, as in Figure 3.2.

Before I discuss bargaining power any further, let us consider the first two elements. Cost-effectiveness and learning may influence profitability in different ways, depending on what the specific circumstances are. Cost-effectiveness is a fairly straightforward concept in a static context. When learning is involved, it is rather less intuitive. Costs may be curbed following the acquisition of relevant knowledge, which usually requires a (costly) learning process. Whether it is convenient to undergo such a learning process depends on expectations concerning the future.

It is, however, doubtful that cost-effectiveness is the key variable for profitability: product quality also has a fairly important role, especially in wealthier economies.¹⁶ 'Good' products may be more profitable than 'cheap' ones even though they are more expensive. Here, too, the convenience of the learning process to achieve product quality depends on expectations about what the market is going to be like – what it is going to deem a 'good' product – as well as on expectations about the cost structure and relative prices. Under these circumstances a strategy involves the pursuit of competitiveness within a scenario that management deems likely to occur. Learning therefore consists in identifying both the means to achieve competitiveness and the relevant scenario.

Up to this point of my analysis, learning allows the firm to identify the most appropriate ways to compete with other agents in the market. The behaviour of the firm is not exclusively outward looking, however. In a learning environment, the cost and quality of output also depend on how capabilities are put to use within the organization. In a new institutionalist setting this occurs through incentive compatible arrangements that make agents behave so as to meet the management's requirements. While this may be plausible when the fulfilment of a task can be somehow assessed, it hardly works when learning is involved: the achievement of a cognitive goal may not be assessable because, *ex ante*, it may not be possible to identify the goal (future knowledge) in the first place. The problem is not quite that a principal will be unable to control his/her agent. It is that the agent him-/herself needs to know what he/she has to look for, that is, what problem he/she has to solve. In general the agent will be able to identify and solve a problem only if he/she appreciates its relevance, that is, if he/she is able to situate it in a strategic setting. This means that the agent must have a strategic setting in mind and it must be consistent with his/her management's strategy.

Owing to the idiosyncratic features of learning – which depend not only on personal characteristics but also on the specific tasks individuals focus on – workers need not view the firm's environment in the same way as management. A common view, however, is essential if the firm is to pursue a consistent strategy. Workers not only need to have specific skills, they must also view things according to management's strategic perspective.

When – following Richardson ([1972] 1990, p. 231) – we refer to capabilities as 'knowledge, experience and skills', there is more to knowledge than just know-how: an all-encompassing cognitive frame is also involved.¹⁷ This leads Witt to stress the role of involvement. He argues that workers cannot share their management's strategic outlook 'on the basis of a mere instruction process or by devising organizational and administrative routines. It is socialization in informal communication processes within the firm that is crucial for inducing people to adopt those conceptions' (Witt 1998, p. 167). In Witt's view, management does not just tell workers what to do. By providing them with a shared cognitive frame, it teaches them to look at things from a specific perspective. This frame isolates that part of the environment that is deemed relevant and identifies the priorities according to which it has to be analysed. In other terms, management provides workers with a common 'cognitive context'.¹⁸

Witt is correct when he points out the restrictive view that new institutionalists have of the activities within a firm. Nonetheless, he does not actually deal with possible conflicts of interest. He acknowledges that asymmetrical information may be relevant, but only because management – the entrepreneur, in Witt's terms – may fail to involve its workers. He therefore conflates inconsistent strategic views with conflicts of interest. In what follows I shall contend that this is not appropriate. Management has to deal both with the creation of a common cognitive context and with the existence of conflicting views associated to distribution. The former requires 'persuasion'; the latter requires 'bargaining' or 'politics' (March and Simon 1958). This is where bargaining power comes into the picture. The division of labour has an important role to play as a 'political' tool. It determines what single agents need to know, thus also their bargaining power. Before I discuss this issue any further, I must elaborate on the importance of knowledge in relation to capabilities. This is the subject of the subsection that follows.

Capabilities and Knowledge

A worker's (or a department's) capability is not just any collection of 'knowledge, experience and skills'. That collection must be relevant to the strategic outlook of management and it also has to be functionally oriented, that is, it must enable the agent to identify, and cope with, the specific problems that the pursuit of the firm's strategy raises. As for the capability of an entrepreneur, it does not merely consist in the ability to match exogenous competitiveness requirements with the capabilities that are available at some given moment. Rather, it consists in the ability to conceive a cognitive image that will functionally orient the capabilities of the firm.

Capabilities include, in this perspective, a broad notion of knowledge, defined as a structured belief system about the way things are and the way things should be (Stein 1997).¹⁹ Emphasis is, here, on beliefs about 'the way things should be'. It is this feature of knowledge – a perspective, which in our case includes the main goal of the firm, profitability, as well as a range of subgoals that are deemed functional to the former – that the strategic outlook and the individuals working in the firm must share.²⁰ Both in the case of the worker and in the case of management, capabilities involve learning how to use previous knowledge – about how things are – in order to obtain what is believed the way things should be. In this sense, learning does not consist in adding newly processed information to a pre-existing stock of knowledge; it is the process whereby previous knowledge is viewed in a new perspective.²¹ Knowledge in a community includes various belief systems, that is, various outlooks on reality and on how things should be. Only part of this knowledge is required to achieve a business goal: this is why a strategic outlook need not be intuitive to workers.

Three aspects of this manifold nature of knowledge should be outlined. The first one is *relevance*. Some skills may be useless (irrelevant) in terms of the goal pursued: a caring parent may wish to learn about the best possible way to bring up a child but this may be of little help to a firm's activities when, say, latching is required. The second one is *orientation*. Although a skill may be appropriate, it may be inadequately used (misoriented): a researcher with an academic background may be proficient but his/her previous experience may make him/her incapable of complying with the relatively more stringent time constraints that an R&D (research and development) department has.

The third aspect of knowledge is *consistency*: some of its elements may or may not conflict with others. A very important case consists in conflicting (inconsistent) goals associated to the absence of a shared view as to what the common good is.²² This may be determined by a *misperception* of a superior common interest, as when knowledge of what is best for a single individual or a single department apparently conflicts with what is best for the company as a whole. Such a situation may occur either because the agent who pursues the local goal is not capable of understanding the firm's overall goals or because he/she was not appropriately involved by management and did not fully understand that a convergence of interests is possible.

An inconsistency of greater significance occurs when a common good is not identified and is believed not to exist. This *value inconsistency* may occur when knowledge as an overall view of life conflicts with the specific knowledge required by a firm's activity. The pursuit of local goals, contrary to the above example of misperception, may be determined by the intentional refusal to subsume one's personal interests to the organization's

interests. Thus, on grounds of social equity, workers may claim a proportion of value added which contrasts with the profit goal underlying their employer's strategy.²³

It may be worth emphasizing that the main consequence of knowledge inconsistency within a firm does not lie in the potential outcome of the conflict, for example, lower profit than expected, or in the greater importance that informational asymmetries – for example, moral hazard – may have. It consists in the absence of a common strategic view. If some or all of the workers use a cognitive frame that is not compatible with the one provided by management, cognitive dissonance may ensue, leading to a potential collapse of the firm as an organization (Leasby 1999).

In the light of the above features of knowledge it is possible to delve into how management shapes the learning process within a firm. Assuming a strategic outlook exists, three types of purposeful action are possible so far. *Capability selection* occurs when an employer selects (hires) those individuals whose capabilities are potentially functional to the company's strategy. *Capability shaping* occurs by involving the workers of a firm in its strategy. *Internal knowledge selection* consists in selecting the knowledge that results from the ongoing learning process within the firm: misoriented knowledge has to be reoriented, relevant knowledge has to be enhanced, irrelevant knowledge has to be neutralized and inconsistent knowledge has to be discarded or somehow neutralized.

The above discussion was centred on knowledge within firms. It can be extended to knowledge within the value chain. From a firm's point of view, the knowledge of the firms it interacts with may be irrelevant, misoriented or inconsistent with respect to its profit goal. The relations it establishes with them – much like those with single workers – need not merely acknowledge the existence of these differences: it may attempt to act upon them. Thus, it will not only select firms with the appropriate knowledge; it will also try to shape their capabilities and enhance convergence in learning processes.

If the firm has a dominant role in the value chain, that is, its market power is such that client firms can only adapt to its strategy, it may succeed by devising a division of labour that will eventually favour such a convergence. Independently of ownership, it will then treat those firms just as if they were single departments or workers. Conversely, when no firm has the bargaining power to prevail over the others, this strategy will not be possible: the strategic outlooks of the firms may still converge, but only if at least one of the firms provides a cognitive frame that takes into account the interests of the others.

What the above discussion leads to is that a parallel may be traced between inter-firm relations within the value chain and intra-firm relations

This issue will be discussed in greater detail in the section on 'Distribution, learning and specialization'.

The Division of Labour and Knowledge Creation

The first subsection in 'Capabilities and knowledge creation' stressed that the cognitive context provided by management must be consistent with the overall profit goal of the firm. The second one pointed out what this requirement implies for the learning processes of workers and client firms. Let us now return to the involvement issue.

Independently of a management's efforts to involve workers, two circumstances may prevent them from learning according to the former's cognitive frame. First, 'misperception' may easily occur when the cognitive frame provided by the management is not related to what a worker does. A problem/goal is usually identified in so far as it falls within the range of problems/goals one usually tackles. When the range of assigned tasks is narrow, the problems a worker is able to appreciate are very specific. As the range becomes more extensive, the degree of generality of the problems may rise as well. Thus, the tasks assigned to someone provide him/her with a specific standpoint. From that standpoint, the firm's general goals may be too abstract in relation to those of the single department or of the single individual. In other words, when a worker is only expected to execute a mental procedure, it is most likely that he/she will not be able to appreciate the subtleties of a new technology. This is a case where 'workers do not know enough'. Skills are that part of capabilities that is strictly associated with assigned tasks. If the division of labour does not provide a worker with the skills to identify extensive ameliorations, sharing a strategic outlook may be of little help.

Second, the overall knowledge of the workers may determine what I defined above as 'value inconsistency'. In other words, owing to their political, religious or ethical values, workers may choose not to meet all the requirements that the firm's goals imply. A typical case is when they do not accept the management's views on distribution; another case may occur when workers claim better working conditions, albeit at the expense of profit. Under these circumstances, workers may actually put forward a 'structured belief system', which contrasts the management's cognitive frame and puts forward alternative actions. This latter case may be one where 'workers know too much' relative to the management's requirements.

Let us focus on the relevance of these two circumstances. The first one suggests that Witt's view, whereby communication is the only channel that provides workers with an appropriate knowledge context, is misleading: the

division of labour also plays an important role. Moreover, the division of labour may purposefully be chosen in order to achieve the knowledge context decided by management. Management may decompose strategy-related problems – that is, choose tasks – so as to provide guidelines to the learning processes of the workers.

The second circumstance points precisely to what learning processes are required. When workers have an extensive knowledge of the activities carried out by the firm, they are more likely to share their management's strategic outlook and to learn to solve problems they are confronted with. Especially when competitiveness requires widespread problem solving, it is therefore suitable to extend the range of tasks that workers are assigned. On the other hand, when a value inconsistency exists, the knowledge workers have may increase their bargaining power at the expense of the goals pursued by management. Thus, although extensive knowledge may be convenient in terms of problem solving, when workers are not involved it may also preclude profitability.

An appropriate learning process by the workers is fairly easy to identify if loyalty prevails. When this is not the case and loyalty²⁴ must be reinstated, such an identification may be problematic. A division of labour may be devised so as to restrict the range of tasks single workers carry out, thus also their learning potential. This determines a shift in the balance of knowledge within the firm, thereby leading workers to accept strategies that forsake their interests. It also prevents them from taking part in the overall problem-solving process that the firm is involved in. Thus loyalty (and short-run profitability) may be reinstated at the expense of the firm's competitiveness and (long-term) profitability.

The above discussion allows us to reassess the role and origin of capabilities and the division of labour in terms of the overall strategy a management pursues. The way capabilities are created depends on the involvement and loyalty of workers. When involvement is not possible, the division of labour must ensure the achievement of loyalty by acting on the knowledge that workers can gain access to. In so doing, the division of labour affects present profitability but it also acts upon the learning processes – thus the creation of new capabilities – within the firm. The loyalty required for short-run profitability may be achieved through a division of labour that is incompatible with the learning processes required for long-run profitability. Consequently, competency traps²⁵ may ensue.

In the section that follows, I shall point to possible inconsistencies among the subgoals that firms pursue. The aim is to show how a division of labour that is functional to short-term profitability may undermine long-term profitability.

DISTRIBUTION, LEARNING AND SPECIALIZATION

Production and Distribution

The previous sections discussed the role of problem solving and strategy. Within this framework a strategy was claimed to involve a range of subgoals, which eventually ought to allow the achievement of the main goal. What needs to be assessed is whether the subgoals are mutually consistent, thereby converging towards the main goal. The aim of what follows is to argue that inconsistencies are possible and that the outcomes they lead to may be far from desirable from the firm's – and society's – point of view.

Let us consider the following identity, referred to a single firm:

$$P = \frac{P}{VA} * \frac{VA}{O} * O$$

where P is profit, VA is value added and O is output.²⁶ The identity may be read as follows. Profit results from:

- the share of profit in value added, that is, distribution within the firm;
- the proportion of value added over output, that is, the degree of vertical integration of the firm; and
- sales.

What the decomposition suggests is that a firm may pursue its profit by acting on three distinct fields of action: the good's market, where producers of the same good operate; the (external) value-added chain, where firms linked by upstream or downstream relations operate; and the activities within the firm.²⁷ These fields of action are interdependent but it is appropriate, in the first instance, to examine them separately.

A firm may act upon the product's market by increasing its sales (O) for any given degree of vertical integration (VA/O). Assuming the level of aggregate demand is given, a rise in sales is possible by redefining the composition of demand, at the inter- or intra-industry level.²⁸

The second field of action consists in the relations the entrepreneur establishes within the firm. Given the total amount of the firm's value added, profit may be increased only by increasing the profit share (P/VA) at the expense of the value added that goes to workers. This goal may be achieved with or without the consent of the workers. The first case occurs when workers believe that a superior common goal exists and may be pursued.²⁹ This usually happens when workers are involved in the entrepreneur's strategic outlook. The second case is more troublesome because

it implies conflicting beliefs about the nature and/or existence of a common goal.

The third field of action consists in inter-firm relations within the value-added chain. The goal, here, is to raise the firm's proportion of value added over output VA/O . Two situations are possible. When control of the phases of production does not change, the share of value added rises if the firm's prices rise in relation to those of other firms in the value chain. The second situation occurs when, all other things given, the firm gains access to the most profitable phases of production.³⁰

In all three cases a distributive conflict emerges between two (groups of) parties. A successful strategy would imply that these conflicts are dealt with so as not to disrupt economic activity. This may be done either through involvement – in Witt's sense – or through loyalty – in Simon's sense.³¹ When the former is not possible and the latter must be resorted to, a possible strategy is to devise a division of labour that reduces the negative consequences of the conflict by creating an appropriate knowledge context. In the subsection that follows I shall discuss the implications that such a response may lead to under two opposite sets of circumstances. The aim is not to provide a fully fledged model but to point out what seems to be a crucial issue: the division of labour may foster distinct – possibly inconsistent – types of capabilities and patterns of specialization.

Distribution and Learning

Suppose that a firm has a competitive edge, so that its output and value added rise. Redistributive action within the company or within the value chain is not necessary and a cooperative environment in these two fields of action can be achieved. Management may therefore carry out a long-term strategy to foster quality competitiveness. This consists in devising products and production processes that define appropriate market boundaries for the products of the firm: the ideal outcome is to qualify and differentiate one's products to the point that a monopoly ensues; a less stringent outcome is to create a well-defined market niche.

A quality-centred strategy requires the enhancement of capabilities that favour qualitative improvements. In so far as this strategy is successful, value added within the firm and within the value chain is going to grow so that distributive tensions will not be strong and cooperation will be easier to accomplish. The ensuing learning process is depicted in Figure 3.3.

An alternative process is one where redistributive action is required. Suppose that competition on the product market is very fierce and that the company's market share is likely to fall.³² The only way to offset the ensuing drop in profitability is to act on the two remaining fields of action. Let us

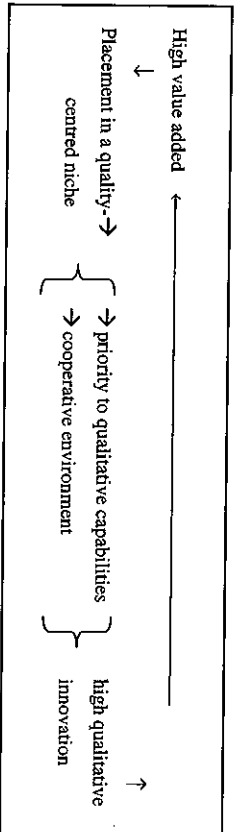


Figure 3.3 The learning process in a quality competitive strategy

focus on relations within the company. If value added drops and profit must remain constant, P/V_A must rise and the wage bill must drop. This may imply lower wages and/or higher productivity followed by – or associated with – layoffs. Alternatively, the fall in value added may be offset by acting on inter-firm relations within the value chain. Here V_A/O must rise, which requires that, given the boundaries of the firms, suppliers cut prices and/or (non-final market) buyers suffer price rises.³³

The above strategies accentuate the underlying distributive conflict between management and the other parties involved, be they workers or firms. This is likely to prevent a common cognitive frame from being accepted by the parties. Thus, the company's management will have to focus its learning activity on the best ways to check possible reactions as well as on how to cut costs. Note that the client firms involved in such a strategy will most likely behave in a similar fashion. Given the demand constraint, they will try to maintain profitability by cutting costs. This will determine a redistribution of income both among firms and between wages and profit. Under these circumstances, relations among the parties involved recall those depicted by the new institutionalist theory: the absence of a common view increases contractual hazards so that the key issue is to devise contracts with appropriate safeguards (Williamson 2000). The real problem, however, is to achieve the bargaining power that will allow those contracts to be accepted: workers might well go on strike; client firms might look for new partners.

When loyalty is undermined, the key strategic issue that management must tackle is to prevent the parties affected by redistribution from having any critical control (knowledge) over the core activities of the firm or the value chain. The capability to seek alternatives depends on how much the parties know. When 'workers know too much', management may assign tasks – it may devise a division of labour – so that the core capabilities are in the hands of the management or of those who remain involved in its strategy.³⁴ In a similar fashion and with the same intentions, management

may redefine the inter-firm division of labour within the value chain. Gaining access to a key resource, especially a knowledge-based one, is a typical way to devise what tasks need to be carried out within the firm and what tasks are of minor importance.³⁵

Let us focus on the learning behaviour all this leads to. In so far as this strategy is successful, profitability is achieved in the short run. Under special circumstances – associated with the price elasticity of demand for the goods it produces – the company may even achieve price-based competitiveness. Since low costs are pursued, management will resort to the capabilities that enhance this subgoal. Other capabilities, which would enhance quality-based competitiveness, will be relatively neglected. Furthermore, owing to the lack of cohesion these policies lead to, cooperation to improve quality is most likely to fade away. The final outcome is that the learning process depicted in Figure 3.1 will favour a specialization in the market niche where prices are valued more than quality. Ultimately, since the division of labour devised to keep workers and client firms under control affects the nature of future capabilities, the consequence is that the pursuit of an appropriate bargaining power today precludes a whole range of learning processes that would enhance quality competitiveness on the product market tomorrow.³⁶ The process is summarized by Figure 3.4.

The two processes depicted in Figure 3.4 are characterized by self-reinforcing learning processes. Firms learn to solve the problems they need to cope with. They focus on some activities at the expense of others, so they end up specializing in those specific activities. This occurs both within and among firms belonging to the same value chain. Similarly, since strategies depend on the capabilities available at any given moment, they tend to be self-reinforcing as well. The nature of the competitiveness pursued – specialization – tends to persist over time.

Self-reinforcement occurs within industries as well. Interaction among firms is associated with productive links. It also depends on learning processes under uncertainty. Bounded rationality and the absence of a general solution to their problems forces economic agents

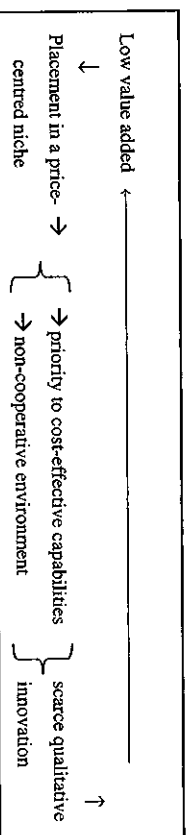


Figure 3.4 The learning process in a price competitive strategy

to resort to 'ready-made anchors of sense, ways of partitioning the space of representations, premises for decisions, and bounds within which [they] can be rational – or imaginative' (Loasby 1999, p. 46). These anchors of sense derive from common patterns of behaviour but they also determine them. It is therefore most likely that firms will converge, at least to some extent, towards a common conception of competitiveness. The implication is that the above processes may provide some insights on the patterns of industrial and, given sectoral interdependence, regional specialization.

The above conclusions require a few qualifications. The processes here outlined need not be as clear-cut as they appear. First, cost-cutting and quality-enhancing strategies were assumed to be mutually inconsistent. This need not always be the case, as when quality enhancing occurs on the shop floor and does not require time-demanding efforts to create the appropriate capabilities and to acquire the relevant technical knowledge. Under these circumstances the creation of capabilities that favour cost competitiveness might coexist with the creation of capabilities that favour quality competitiveness. The second element concerns the nature of the learning process. Stein (1997) notes that *realized* learning includes both *intended* and *emergent* – or spontaneous – learning. Thus, when management determines a division of labour functional to a specific learning process, the final outcome may differ owing to emergent learning.

Two circumstances may accentuate the depicted processes, however. The first one is bounded rationality: it is easier to focus on a single goal rather than on two, possibly inconsistent, ones. The second is the stringency of profitability: a quick rise in interest rates, for instance, is likely to turn a firm's main goal into a particularly stringent constraint, thereby forcing it to act on a quick cost-stripping basis, at the expense of long-term improvements in the qualitative nature of its output (Perlman 1996).

CONCLUDING REMARKS

The general conclusion of the chapter is that firms learn what management deems appropriate. Profit-seeking management may focus on either the production or the distribution of value added. It consequently devises a division of labour that reflects the chosen priority. The ensuing capabilities and pattern of specialization are likely to re-enforce the original strategic outlook. In some instances, the pursuit of short-run profitability may forsake long-run profitability.

A theoretical implication of the above analysis is that it provides a possible account for differing growth rates. Its emphasis is not on circumstances

that merely constrain business behaviour (North 1990); rather, it suggests that managerial strategies play a major role in determining capabilities, learning processes and business behaviour itself.

The policy implication is that the ensuing patterns of specialization and growth can change only if the learning processes within firms are changed. Measures that focus on the immediate reactions of firms but disregard effects on learning processes may lead to undesired outcomes. Restrictive monetary policies, for instance, may favour cost-effectiveness but they may also enhance a process such as the one depicted in Figure 3.4. Similarly, policies that lay emphasis on labour flexibility and wage cutting favour profitability through distributional measures, thereby providing few incentives to the enhancement of qualitative competitiveness.

In so far as public policy has to take into account how firms learn, it cannot rely on a mechanistic stimulus-reaction framework: craftsmanship needs to prevail over technique. Nonetheless, general points of reference exist. Price- and quality-based strategies, for instance, may be favoured or contrasted by the time range the firm has: in terms of expected profitability, a quality-based strategy usually requires more time than a cost-based one. Although both strategies require that capabilities be identified and created, the latter may act upon existing products and processes whereas the former usually requires the identification and introduction of new products and/or processes. The conclusion is that a price-based policy is going to be more likely if the timing of returns on investment is short. A typical circumstance that may act upon this timing is the rate of interest, that is, monetary policy.

NOTES

1. I wish to thank Marco Rangone for his comments. The usual disclaimer applies. Financial help from CNR (Consiglio Nazionale delle Ricerche, Italy's National Research Council) (contract n.98.01.492.CT10) is gratefully acknowledged.
2. Does a firm learn? Typically, one might answer that this expression is metaphorical since only individuals can actually learn. Although the chapter is not inconsistent with this view, it may be worthwhile to 'Consider the meaning of an action to an individual undertaking it. It depends in part on how it is received by other agents. But the reception by other agents will only correspond to the meaning which the individual gives to the action if all agents share the same understanding of the action. In other words, it seems that each individual, if they are to achieve understanding, must relinquish some part of their idiosyncratic interpretation of their actions. This is something social, as distinct from individual, but where does it come from? There are only individuals attempting to understand their actions and consequently it seems again that we can understand neither the whole nor the parts in isolation: the individual and society are mutually constituted' (Hargreaves Heap 2000, p. 158).
3. The section 'Whence capabilities?' provides a definition of capabilities and references that help to clarify some of the nominal ambiguities in the literature. Suffice it to say here, that

4. Carlsson and Eliasson remark: "competence which is difficult to articulate at the individual level may not be recognized or even recognizable in a different environment or organizational structure operating under a different set of assumptions or rules. Research on business competence thus borders on the unsearchable" (Carlsson and Eliasson 1994, p. 694).
5. Dosi et al. (2002) provide a useful survey of the literature where they attempt to distinguish conceptual from nominal differences in the terms used.
6. Apparently the execution of a procedure requires no problem solving because a rigid routine has been set up already. Understanding instructions and applying them, however, remains a problem that the agent needs to solve, even though a great many other people may have already solved it before him/her (Egidi 1992).
7. It is therefore possible to extend Egidi's remark whereby 'the conjectural division of problem solving is a process which gives rise to a division of knowledge' (Egidi 1992, p. 166) to the division of labour in general.
8. [A] set of production/manufacturing activities are typically implied by a particular research focus, a firm's "core business" . . . by which is meant the set of competences which define its distinctive advantage' (Teece 1988, p. 265).
9. Nelson's comment refers to an earlier version of Dosi et al. (1992).
10. The degrees of freedom Nelson posits in his definition are denied in the rather deterministic statement Teece makes with regard to the same issue: 'Except by entering the market for corporate control, profit seeking firms have limited abilities to change products and technologies' (Teece 1988, p. 266). Similarly, Teece and Pisano argue: 'The strategic posture of a firm is determined not only by its learning processes and by the coherence of its internal and external processes and incentives, but also by its location at any point in time with respect to its business assets' (Teece and Pisano 1998, p. 201).
11. Unless otherwise specified, in the rest of the chapter the division of labour is intended to be the internal division of labour.
12. In an uncertain environment a range of outlooks is possible. Through existing capabilities in the firm, management collects the relevant information and interprets it. Capabilities as such, however, do not provide a unique and consistent strategic outlook. It is the management's task to select relevant issues and identify the appropriate strategy.
13. I shall also leave out of my discussion possible conflicts between ownership and management.
14. 'The business man's place in the economy of nature is to "make money", not to produce goods' (Veblen [1919] 1964, p. 92).
15. This affects what Iansiti and Clark define as 'technology integration', that is, 'the capability to link the evolving base of technical knowledge . . . to the existing base of capability within the organization' (Iansiti and Clark 1994, p. 570). The relevance of the issue is stressed, with special reference to large firms based in OECD countries, by Pavitt who states that 'lack of technological knowledge is rarely the cause of innovation failure . . . The main problems arise in organization' (Pavitt 1998, pp. 434-5) and subsequently argues that 'This can best be understood if more attention is paid to what Adam Smith said about the division of labour, and less to what Schumpeter said about creative destruction' (*ibid.*, p. 435).
16. In standard microeconomics, cost-effectiveness is reflected in the shape of the cost curve, while quality affects the shape of the demand curve.
17. This issue is accentuated by the fact that 'the key characteristic of detailed management control is increasingly bounded and impaired as a result of the growing complexity of the production process' (Hodgson 1999, p. 197).
18. 'We use the term context for its meaning in the phrase, "the meaning of information depends on context"' (Imai 1990, p. 188). An analogy is possible with a research programme or a scientific paradigm (Loasby 1991) but the role of codified and systematized knowledge and analytical rigour in a knowledge context is obviously less important.

19. The definitions adopted here do not coincide with those provided by Stein (1997) but, in my view, they are consistent with the overall framework he adopts.
20. Obviously this implies that a great number of beliefs on 'how things are' must be shared as well.
21. From this point of view, cognitive structures co-evolve with the strategies pursued (Nootboom 2000).
22. Such an inconsistency may occur both at the individual level (Sen 1982; Hirschman 1984) and at the level of an organization (March and Simon 1958; Loasby 1991).
23. This latter kind of inconsistency generally leads to March and Simon's (1958) notion of 'bargaining' and 'political' conflicts within an organization.
24. Following Simon (1997), two types of loyalty are possible: motivational and cognitive. In the first case, workers rely on the management's decisions because they believe they cannot properly assess what the relevant circumstances are. In the second case, the activities they carry out force them to concentrate their learning on those activities, thereby losing track of what is going on at a more general level.
25. 'A competency trap can occur when favourable performance with an inferior procedure leads an organization to accumulate more experience with it, thus keeping experience with a superior procedure inadequate to make it rewarding to use' (Levit and March 1988, p. 322).
26. In what follows, sales are assumed to match output.
27. The above variables do not depend on the action of firms alone. Distribution affects relative prices and sales, and output depends on aggregate demand. For simplicity's sake these circumstances will be ignored. Government intervention, especially in terms of income distribution, will also be assumed away.
28. In the first case, the firms that belong to an industry pursue a common goal: to expand the industry's market share - thus their overall value added - at the expense of other industries. In the second case a conflict arises among those same firms: given the total amount of value added in the industry, the value added of a firm may rise only at the expense of another firm. What is at stake is intra-industry distribution.
29. This is typically the case when workers believe that higher profits are required for investment and that investment increases employment and improves the competitiveness of the firm, thus future value added.
30. The distinction provided here is only conceptual. Mergers and acquisitions may allow a firm not only to acquire the most profitable phases but also relevant resources and/or knowledge that will eventually allow favourable changes in the relative prices within the value chain.
31. Note that these goals are not inconsistent. Cognitive loyalty is likely to favour motivational loyalty. Since loyalty implies that workers hardly perceive possible alternatives, this circumstance may eventually make involvement easier.
32. This is a case where the firms in the market have inappropriate business conceptions and the company under inquiry fears it may have to forsake its goals to the advantage of its competitors.
33. A third strategy crosses the two fields of action. It consists in delocalizing production (outsourcing). A special case occurs when former workers set up firms that will carry out some of the activities previously carried out by the company.
34. Braverman (1974) stressed how this occurred under the Taylorist organization of production. Coriat and Dosi (1998) make similar considerations for Toyotism.
35. Some authors would refer to this as the creation of a competitive advantage through internalization.
36. A priori, this strategy could be just as profitable as the quality-centred one. In Western economies this is less straightforward, owing to competition from the Third World and low price elasticities. Indeed, a 'paradox of competition' may occur: "Intense local price competition can reduce global competitiveness . . . by limiting the capacity of the sector to invest in its future; the result is a diminished capacity to compete against rival sectors located elsewhere" (Best 1990, p. 18).

REFERENCES

- Best, M.H. (1990), *The New Competition. Institutions of Industrial Restructuring*, Cambridge: Polity.
- Braverman, H. (1974), *Labor and Monopoly Capital*, New York: Monthly Review Press.
- Carlsson, B. and G. Eliasson (1994), 'The nature and importance of economic competence', *Industrial and Corporate Change*, 3, 687-711.
- Coriat, B. and G. Dosi (1998), 'Learning how to govern and learning how to solve problems: on the co-evolution of competences, conflicts and organizational routines', in A. Chandler, P. Hagström and O. Solvell (eds), *The Dynamic Firm: The Role of Technology, Strategy, Organization, and Regions*, Oxford: Oxford University Press, pp. 103-33.
- Dosi, G. (1994), 'Firms, Boundaries of the', in G.M. Hodgson, M.R. Tool and W.J. Samuels (eds), *The Elgar Companion to Institutional and Evolutionary Economics*. Aldershot, UK and Brookfield, US: Edward Elgar, pp. 229-37.
- Dosi, G. and M. Egitdi (1991), 'Substantial and procedural uncertainty', *Journal of Evolutionary Economics*, 1, 145-68.
- Dosi, G., R. Nelson and S. Winter (2002), 'Introduction', in *The Nature and Dynamics of Organizational Capabilities*, Oxford: Oxford University Press.
- Dosi, G., D.J. Teece and S. Winter (1992), 'Towards a theory of corporate coherence: preliminary remarks', in G. Dosi, R. Giannetti and P.A. Toninelli (eds), *Technology and Enterprise in a Historical Perspective*, Oxford: Oxford University Press, pp. 185-211.
- Egitdi, M. (1992), 'Organizational learning, problem solving and the division of labour', in M. Egitdi and R. Marris (eds), *Economics, Bounded Rationality and the Cognitive Revolution*, Aldershot, UK and Brookfield, US: Edward Elgar, pp. 148-73.
- Hargreaves Heap, S.P. (2000), 'How far can we get with hermeneutics', in P.E. Earl and S.F. Frowen (eds), *Economics as an Art of Thought: Essays in Memory of G.L.S. Shackle*, London: Routledge, pp. 149-72.
- Hirschman, A.O. (1984), 'Against parsimony: three easy ways of complicating some categories of economic discourse', *The American Economic Review*, 74(2), 89-97.
- Hodgson, G.M. (1999), *Economics and Utopia: Why the Learning Economy is Not the End of History*, London: Routledge.
- Iansiti, M. and K.B. Clark (1994), 'Integration and dynamic capability: evidence from product development in automobiles and mainframe computers', *Industrial and Corporate Change*, 3(3), 557-605.
- Imai, K. (1990), 'Patterns of innovation and entrepreneurship in Japan', in A. Heertje and M. Perlman (eds), *Evolving Technology and Market Structure: Studies in Schumpeterian Economics*, Ann Arbor, MI: University of Michigan Press, pp. 187-201.
- Langlois, R.N. and N.J. Foss (1999), 'Capabilities and governance: the rebirth of production in the theory of economic organization', *Kyklos*, 2, 201-18.
- Leijonhufvud, A. (1986), 'Capitalism and the factory system', in R.N. Langlois (ed.), *Economics as a Process*, Cambridge: Cambridge University Press, pp. 203-24.
- Levit, B. and J.G. March (1988), 'Organizational learning', *Annual Review of Sociology*, 14, 319-40.
- Loasby, B.J. (1991), *Equilibrium and Evolution. An Exploration of Connecting Principles in Economics*, Manchester: Manchester University Press.
- Loasby, B.J. (1999), *Knowledge, Institutions and Evolution in Economics*, London: Routledge.
- March, J.G. and H.A. Simon (1958), *Organizations*, New York: John Wiley & Sons.
- Marglin, S.A. (1974), 'What do bosses do? The origins and functions of hierarchy in capitalist production', *Review of Radical Political Economics*, 6, 60-102.
- Minsky, H.P. (1985), *The Society of Mind*, London: Heinemann.
- Nelson, R.R. (1991), 'Why do firms differ, and how does it matter?', *Strategic Management Journal*, 12, Special Issue, Winter, 61-74.
- Nelson, R.R. and S. Winter (1982), *An Evolutionary Theory of Economic Change*, Cambridge, MA: Harvard University Press.
- Nooteboom, B. (2000), *Learning and Innovation in Organisations and Economics*, Oxford: Oxford University Press.
- North, D.C. (1990), *Institutions, Institutional Change and Economic Performance*, Cambridge: Cambridge University Press.
- Pavitt, K. (1998), 'Technologies, products and organization in the innovating firm: what Adam Smith tells us and Joseph Schumpeter doesn't', *Industrial and Corporate Change*, September, 7(3), 433-52.
- Perlman, M. (1996), *The Pathology of the US Economy: The Costs of a Low-Wage System*, London: Macmillan.
- Richardson, G.B. (1972) 1990, 'The organization of industry', *Economic Journal*, September, reprinted in Richardson, *Information and Investment*, Oxford: Clarendon Press, 1990, pp. 224-42.
- Sen, A. (1982), 'Rational fools: a critique of the behavioural foundations of economic theory', in A. Sen, *Choice, Welfare and Measurement*, Oxford: Basil Blackwell, pp. 84-106.
- Simon, H.A. (1976), 'From substantive to procedural rationality', in S.J. Latsis (ed.), *Method and Appraisal in Economics*, Cambridge: Cambridge University Press, pp. 129-48.
- Simon, H.A. (1997), *An Empirically Based Microeconomics*, Cambridge: Cambridge University Press.
- Stem, J. (1997), 'How institutions learn: a socio-cognitive perspective', *Journal of Economic Issues*, 3, 729-40.
- Teece, D.J. (1988), 'Technological change and the nature of the firm', in G. Dosi, C. Freeman, R. Nelson, G. Silverberg and L. Soete (eds), *Technical Change and Economic Theory*, London: Pinter, pp. 256-81.
- Teece, D.J. and G. Pisano (1998), 'The dynamic capabilities of firms: an introduction', in G. Dosi, D.J. Teece and J. Chytry (eds), *Technology, Organization, and Competitiveness: Perspectives on Industrial and Corporate Change*, Oxford: Oxford University Press, pp. 193-212.
- Veblen, T. (1919) 1964, 'The vested interests', in *The Vested Interest and the Common Man (The Modern Point of View and the New Order)*, New York: Kelley, pp. 85-113.
- Williamson, O.E. (2000), 'The new institutional economics: taking stock, looking ahead', *Journal of Economic Literature*, September, 38, 595-613.
- Witt, U. (1998), 'Imagination and leadership - the neglected dimension of an (evolutionary) theory of the firm', *Journal of Economic Behavior and Organization*, 35(2), 161-77.

Inv. N. 7184 (facile C.A.S.B.)
del 11-12-04

© J. Stanley Metcalfe and John Foster, 2004

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical or photocopying, recording, or otherwise without the prior permission of the publisher.

Published by
Edward Elgar Publishing Limited
Glensanda House
Montpelier Parade
Cheltenham
Glos GL50 1UA
UK

Edward Elgar Publishing, Inc.
136 West Street
Suite 202
Northampton
Massachusetts 01060
USA

A catalogue record for this book
is available from the British Library

Library of Congress Cataloguing in Publication Data

Evolution and economic complexity / edited by J. Stanley Metcalfe and John Foster.
p. cm.

1. Evolutionary economics. 2. Complexity (Philosophy). I. Foster, John, 1947. II. Metcalfe, J.S. (J. Stanley).

HB97.3.E8858 2004
330.1—dc22

2004047788

ISBN 1 84376 526 8 (cased)

Printed and bound in Great Britain by MPG Books Ltd, Bodmin, Cornwall

Contents

List of contributors
Introduction and overview

vii
ix

PART I THEORETICAL PERSPECTIVES

- 1 Evolutionary foundations of economics
Kurt Dopfer and Jason Potts 3
- 2 On the methodology of assessing agent-based evolutionary models in the social sciences
Paul Ormerod and Bridget Rosewell 24
- 3 What do firms learn? Capabilities, distribution and the division of labour
Paolo Ramazzotti 38
- 4 Dynamic capabilities, tacit knowledge and absorption
Peter Hall 62

PART II MODELLING COMPLEXITY

- 5 The complexity of structure, strategy and decision making
Peter M. Allen 85
- 6 Knowledges, specialization and economic evolution: modelling the evolving division of human time
Esben Sloth Andersen 108

PART III EMPIRICAL PERSPECTIVES

- 7 Erring to be right: the paradox of error in the foundation of probability in economics
Francisco Louçá 151
- 8 Technological and economic mobility in large German manufacturing firms
Uwe Cantner and Jens J. Krüger 172