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Edith Penrose, Organisational Economics and Business Strategy: An Assessment and Extension

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The aim of this paper is to expound Penrose's contribution to the theory of the firm, and examine the contribution of her thinking to economics and business strategy, as well as to discuss some limitations and provide some generalizations of Penrose's work. We also discuss implications for managerial practice and public policy. We claim that Penrose's contribution was seminal. In recognizing the significance of organization to generate new knowledge she went well beyond the bounds of even her own agenda; from a theory of the growth of firms, to a theory of the generation of organizational knowledge and beyond. **Copyright © 2005 John Wiley & Sons, Ltd.**

INTRODUCTION

In 1959, Edith Penrose published *The Theory of the Growth of the Firm* (TGF). The book marked the first attempt by an economist to view firms as real life, 'flesh and blood' organisations. Penrose focused on the 'insides' of such organisations, to explain endogenous knowledge—creation, innovation and firm growth, saw the external environment, as an 'image' in the minds of management, and posited a dynamic interaction between the internal and external environments, which defined what she called firms 'productive opportunity'. She attributed importance to human resources, in particular, management and saw managerial constraints as limiting the rate of growth of firms, albeit not its size *per se*.

In Penrose's approach managers are prime actors, whose 'preferences', however, are shaped by the internal dynamics of firms, their perception of the external (and internal) 'reality', and their own motivation, which include profits, but also socio-psychological elements, to include power and 'the love of the game'. The focus on firms as real life organisations, on human resources, on intra-firm learning, on endogenous knowledge, innovation and growth, and the interaction of exogenous and endogenous to include psychological, factors in determining managerial motivations and firms' growth, puts Penrose in a unique category. We claim here that in fact hers was the first organisational theory on the firm, that goes well beyond (organisational) economics approaches, of the transaction costs type and provides a natural link to management and organisation studies.

The aim of this paper is to first briefly expound Penrose's contribution to the theory of the firm, examine the contribution of her thinking to economics, and business strategy, and to discuss some limitations and provide some generalisations of the Penrosean story, we conclude and discuss implications for managerial practice and public policy. We claim that Penrose's contribution was seminal. In recognising the significance of

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organisation to generate new knowledge she went well beyond the bounds of even her own agenda; from a theory of the growth of firms, to a theory of the generation of organisational knowledge and beyond.

THE THEORY OF THE GROWTH OF THE FIRM (TGF)

TGF is about the *growth* of firms. Firms are seen as 'flesh and blood' real life *organisations*, not points on a cost curve. They consist of human and non-human resources, under administrative authoritative co-ordination and communication. Human, and especially managerial, resources are the most important. Resources provide multiple potential *services*. Firms use their resources to perform *activities* that result in products for sale in the *market* for a *profit*. Firms differ from markets, their *boundaries* defined by the reach of authoritative co-ordination and communication. For a multitude of reasons related to resource indivisibilities and the 'balance of processes', firms always have '*excess*' *resources*. The very performance of activities within firms creates new knowledge through specialisation, division of labour, resource-combination, teamwork and learning.[1]

The cohesive shell of the organisation is of essence in facilitating learning. As excess resources can provide services at zero marginal cost, they motivate entrepreneurs to apply them to new activities, engendering *endogenous innovation and growth*. The profitable marketisation of new innovations requires entrepreneurial thinking, which is the identification and creation of markets. The external environment, markets and demand, are perceptions, 'images' in the entrepreneur's mind. Supply and demand are inextricably linked, as planned supply responds to perceived demand. There is a dynamic interaction between the perceived internal and external environments, which defines a firm's *productive opportunity*. The direction of expansion is shaped by this productive opportunity. There are limits to the growth of the firm, but not to its size (other than the limits to the 'reach' of authoritative co-ordination and communication). The conception and implementation of expansion requires managers whose firm-specific knowledge is a prerequisite for the successful planning and implementation of expansion, therefore, who are not available in the open market. This *limits the rate of growth* and hints to the pre-eminence Penrose attributes to the human resource *par excellence*, i.e. management.

Whilst we think the above to be the heart of Penrose's main argument, these ideas just touch upon a minor part of her overall contribution. She applied her insights to mergers, vertical integration, industry concentration, small firms and industry organisation more generally, as well as to business strategy and government competition policy. Her views on 'impregnable bases' that firms use to compete (to achieve sustainable competitive advantage in today's parlance), the existence of market 'interstices' (areas of no current interest to large firms, which small firms can occupy), the idea that the process of expansion (growth) is almost definitionally efficient but the state (size) need not be (as firms may use size to restrict competition to obtain monopoly profits), and the related idea of competition as the 'god and the devil' (because it is through it firms succeed, but, through its restriction that in some cases they may maintain their market power, even when obtained through efficiency) are as innovative as they are topical and subjects of ongoing discussions.

What is it in Penrose's contribution that has made it so attractive and influential? We believe that the main reasons are both the argument and the method-epistemology. The argument, first, is not just about the theory of the growth of the firm; it is an argument about the theory of (growth of) knowledge. For anything and everything new to even be conceived, perceived, let alone implemented, one needs some prior knowledge, including the very capacity to obtain knowledge, i.e. to learn. There exists a variety of institutions that help achieve this; families, schools, norms, customs and traditions, human interaction in society at large. Hayek's (1945) view was that this knowledge is dispersed and that there is, at least in capitalist economies, an institution par-excellence, the market, that facilitates its transmission and (thus) the co-ordination of individual plans and in the society at large. This is a fundamental insight. Arguably however, Hayek (1945) himself underplayed the importance of institutions (even the market) to *create new knowledge*. Markets indeed can be fundamental in creating new knowledge. For instance, even learning about other people's plans may help modify someone's plans; this is as much about transmitting and distributing existing knowledge as it is about creating new

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knowledge. Yet the important point is that for Penrose it is *firms* which help create knowledge, indeed firms are seen as better at doing so than markets. If so, Penrose both critiques Hayek, since firms involve planning, and complements him, since private firms and markets together—the market system—both create new and transmit (dispersed) knowledge. This has crucial implications for the efficiency of the system as a whole.

Penrose's contribution, however, goes deeper. If knowledge, in general, or even a type of knowledge most suitable for production-related activities, is generated better within firms than without firms, and to the extent that this knowledge is of relevance or use to society as a whole, everything and anything we conceive or perceive and the lens through which we do so, is predicated upon the existence and functioning of firms. Our very perceptions are a function of firms' functioning, in the deep sense of them providing us with a lens through which we perceive the wider environment and even life as a whole. It is in this deeper sense that Penrose's contribution is beyond the normally conceived (even by her) bounds.

The second major reason for the attractiveness of the Penrosian perspective is her method/epistemology. This involves a dynamic interplay between induction and deduction, structure and agency, in the context of a history-informed path-dependent evolutionary dynamic, shaped by actors' conscious, yet path-dependent and structure-moulded actions, in the context of a purposive organisation, the firm.[2] Penrose rejected explicitly biological analogies in the theory of the firm for failing to account for human agency. Her approach anticipated more recent arguments, for example Giddens' (1984) 'duality of structure' and added a cognitive turn in the form of the concepts such as 'image' and 'productive opportunity' (see Turvani (2002) for a discussion of Penrose and cognitive science). These socio-psychological aspects of Penrose's work take her beyond narrow economic-based perspectives.

It is beyond the scope of this paper to deal with all the issues raised by Penrose's work. In the following sections, we focus on some issues of particular relevance to the theory of the firm, and organisations more generally, starting from the significance of Penrose's contribution to economics in general and organisation economics, in particular.

EDITH PENROSE AND (ORGANISATIONAL) ECONOMICS

One can effectively divide economics in two major camps; the one focussing on efficient allocation of resources, often assumed to be scarce, the other focussing on resource and wealth creation.[3] Most classical economists, notably Adam Smith and Karl Marx, but also more recent contributors, such as Schumpeter (1942), have paid attention to the issue of resource and wealth creation. To varying degrees, these economists also dealt with the related issue of resource allocation. Adam Smith, for example, arguably owes his place as the father-figure of modern (neoclassical) economics to his very analysis of the allocative and co-ordination role of the 'invisible hand', or the market. Yet, he believed in the labour theory of value, and attributed wealth creation to labour productivity engendered within firms e.g. his famous pin factory, from where his *The Wealth of Nations*, starts. In the pin factory, labour productivity is achieved through specialisation, the division of labour and teamwork, which leads, among others, to new inventions by those closer at the production process, i.e. labourers. The sources of labour productivity, inventions and the wealth of nations are thus to be found within firms. The realisation of these benefits is only limited by the size of the market. In Young's (1928) powerful insight, the size of the market itself is determined by specialisation and the division of labour; the latter leading to further, more elaborate subdivision of labour and extending the size of the market. In a sense, it is specialisation and the division of labour that determines specialisation and the division of labour, thus productivity and the wealth of nations!

Penrose's place in this debate is prominent. As Loasby (1999) suggests, Penrose has been able to 'reinvent' this classical tradition, which at the time of her writing was all but extinct. Already then, the battle on the nature and scope of economics has been won by the efficient allocation of (scarce) resources perspective of Jevons, Walras and their followers, what we now call the neoclassical perspective. According to this, the scope of economics as a science should appropriately be the analysis of efficient allocation of (scarce) resources. 'Reinventing' the classical perspective was no small feat. Yet we believe Penrose went well beyond this (see below).

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Besides the focus on wealth creation versus resource allocation, the other major (and related) difference between the classical and the neoclassical tradition concerns growth versus co-ordination. As Loasby (1999) and Richardson (1999) explain the neoclassical focus is on co-ordination, while the classical is on growth. Schumpeter's focus was also on growth. He and Penrose had to deal with the issue of the relevance of neoclassical theory to their concerns, and relatedly, the inevitable comparison between the two perspectives. They both chose to claim that both the neoclassical and their own perspectives were useful but for different reasons, so their ideas did not necessarily and fundamentally question the usefulness of neoclassical thinking. In Penrose's famous 'garden' metaphor, neoclassical price theory does not deal with firm growth, which is Penrose's 'garden'. She felt that both neoclassicals and she could tend their respective gardens, and there was little use in trying to bring the two approaches together.

This is a big issue, with which Richardson (1999) deals. He claims that in contrast to Penrose, one needs to deal with both co-ordination and growth, and that Penrose's contribution is arguably the very tool that can help this come about. We agree. Penrose's endogenous knowledge-based concept of 'productive opportunity' of entrepreneurs supplies us with the basis of perceived (and actively aimed for) demands, the fundamental dynamic ex-post quasi-equivalence of supply and demand (in that supply is a response to entrepreneurial perceptions of demand) are potentially powerful tools through which growth and co-ordination can be examined and achieved.[4]

While arguably less significant than the issue addressed by Richardson (of dynamic growth and co-ordination), the degree of compatibility and relative usefulness of efficient allocation versus dynamic growth is of interest and has occupied scholars in economics and (strategic) management. In different terminology and contexts, people like Schumpeter and Porter (1991, 1999) have suggested that both allocative (in Porter operational) efficiency and growth (in Porter strategy) are essential for a country's (firm's) success. Both claimed that even the most efficient countries or firms in resource allocation or operational efficiency would eventually lose out to successful innovators—strategists. Others may disagree. Yet, the moral is that (allocative) efficiency and growth are important. Whether the former is neoclassical price theory in its presently dominant form, of comparative static equilibria reached by rational utility maximising agents, it is less obvious.[5]

Yet, we do think that a version of neoclassical-type approach to firms and industry organisation can be both relevant and useful, in certain cases. Penrose's own analysis helps us show how; notably, her observation, that while the process of firm growth is efficient, the outcome (firm size) need not be, as it is competition that spurs growth and profits, but its very restriction that is often required to maintain such profits. Indeed reading the TGF's last chapters on these issues, one may be excused to believe that they are both unrelated to the book's early ideas and rather early Bain-type market power-based industry organisation, see Rugman and Verbeke (2001) for such an original interpretation.[6] This is not how we see things. A different interpretation is that once firms are large, they may be tempted to make use of their (even through-efficiency-gained) market power, to facilitate co-ordination and planning (which requires a degree of stability, especially after fast growth). This is to allow firms to 'take a breather', consolidate and 'think', to shield themselves from emerging competition from abroad or domestically in mature and declining industries, and also (why not) allow them to receive some 'monopoly profit' they have worked so hard to earn. Some of these issues are raised by Cantwell (2002) and Lazonick (2002) while Penrose herself has been explicit about the co-existence of profit through efficiency and profit through monopoly, claiming that both exist, see Penrose and Pitelis (1999).

In the context of the neoclassical framework, it is arguable that in mature industries one could consider a case of relative stability of market shares and oligopolistic structure, and look at these industries through taking a 'snapshot' in a particular point in time. Depending on the assumptions, the snapshot could show you a contestable market, a limit pricing-based oligopoly, a profit maximising collusive oligopoly (with or without strategic entry deterrence), or any of the existing variations in the IO-type on which see Pitelis (1991) or any IO textbook, e.g. Cabral (2001). It is no coincidence that even Marxists, such as Baran and Sweezy (1966) and post-Kaleckians, like Cowling (1982) have used similar theorising.[7]

In the context of this discussion, Penrose's endogenous knowledge perspective contributes

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fundamentally. It goes beyond Young in explaining why and how the size of the market is itself determined by specialisation and the division of labour (as well as vice versa of course). It provides the requisite perspective and knowledge to approach the synthesis between dynamic innovation (equals) knowledge and (thus) (equals) productivity—growth perspective and dynamic co-ordination through the knowledge provided by firms' own operations and the perceived equivalence (in part achieved through firms' own conscious efforts) of supplies and demands. It helps bring together resource-creation and efficient allocation as explained above, in the fundamental way that it is the internally generated knowledge within firms that is required to supply firms with the very tools to achieve (rather than assume they know how) efficient resource allocation and innovation-growth.

In this sense Penrose's contribution is seminal. Knowledge is internally generated within firms, is an input to what they know, what they do, how they do it, every other issue we referred to and far more. In addition, her approach is more than a re-invention, however important this re-invention is. Smith, Marx, Young, Hayek, and Schumpeter have not dealt with endogenous innovation (equals) knowledge-growth creation. This is also true of other eminent contributors that dealt with related issues, such as Ronald Coase, Alfred Chandler, Nicholas Kaldor, Michal Kalecki, Stephen Hymer, Gynnar Myrdall, and Douglass North. This is crucial. In a world where 'there is nothing new under the sun', to come up with such a unique insight is as good as it can get, especially when this is an insight that also helps explain the very process of perceiving whether, why, and how 'new' is new.[8]

The other important issue on which Penrose can arguably make a significant contribution concerns the 'nature of the firm'. The term of course is Coase's (1937) who went on later (Coase, 1988) to distinguish between the 'nature of the firm' (why do firms exist) and the essence of the firm ('running a business'). Clearly, Penrose has dealt with the 'running' issue more effectively than any other economist. She is the only one that combined the functions of the manager and entrepreneur in conceiving, planning and implementing, i.e. in running a business (Pitelis and Wahl, 1998). While this is rather uncontroversial, it can be questioned whether Penrose also dealt with the issue of the 'nature'. In fact, she did not.

Like many other contributors, e.g. Marris (1999), she took it for granted that firms exist. Coase (1937) has shown that this type of question can prove most fruitful. He equated the 'nature' of the firm with the 'employment relation' and attributed this to the efficiency benefits derived from reductions in market transaction costs. Much ink has been spent already in repeating what Coase said, so we will not do it here. Suffice it to note that, if we accept Coase's view then Penrose's approach has immediate complementary implications. The 'employment relation' can be explained in terms of efficiency gains, effected through productivity enhancements, through endogenous innovation (equals) knowledge-growth, see Pitelis and Wahl (1998). To the extent that (as we believe) dynamic (by definition given Penrose's framework) transaction costs can also be of relevance, it will be the overall dynamic transaction costs reductions cum knowledge-induced productivity benefits that could explain the Coasean firm. Critically and importantly, however, the very perception of when and how to reduce transaction costs can only be afforded through intra-firm knowledge generation, see, among others Fransman (1994), Pitelis and Pseiridis (1999). To assume that firms know this beforehand is far too unrealistic. In addition, it is in contrast to Williamson's (1975) insistence on bounded rationality.[9]

The Penrosean 'insight' however, leads us further afield. The tacit and hard to transmit across markets nature of knowledge, can serve a blow on the very Coasean explanation of the 'nature'. To explain firms from a situation of no firms at all, one requires an entrepreneurial idea aimed to be put in practice. Selling this idea in the open market may be hard for two reasons, at least. First, being tacit, it may be hard to transmit. Second, if in addition (which is possible) this idea also has public goods characteristics, explaining it to anyone can lead to it being expropriated. Among others, this can lead to a competitor at best! (if the original conceiver even manages to go ahead with using it). So we have a two-pronged type of market failure, which, however, is not directly linked to transaction costs.[10] The control afforded to entrepreneurs on their ideas, in the cohesive shell of the firm can be an adequate initial reason for not selling the idea in the open market. Note that this point is prior to, and complements, the idea that firms may have productivity benefits vis-à-vis markets, which can also be an adequate

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non-transaction-costs-related explanation of the 'nature' of firms. Such ideas may critique the very *raison d' être* of the Coasean argument for the 'employment relationship'. For instance, it may well be as dangerous to explain to employees-to-be what your idea is all about, as it is to tell if to anyone else.) If so, efficiency gains from transaction costs (or productivity or other sources of benefits) may not be an adequate explanation for employees voluntary accepting to work for employers. Other factors must be in place such as 'insuring the timid against risk' having a reputation for entrepreneurial flair (obtained, for example, in one's previous experience as an employer or a merchant), control over labour, etc.

Some of the themes above would surely have been recognised by people in the area, in, for example, the work of Knight (1921), Marglin (1974, 1983) (on labour control and obtaining and protecting organisational knowledge, and also Liebeskind (1996) on knowledge protection).[11]

Penrose contributed to all these themes. In addition, anticipating George Richardson's (1972) seminal contribution, she explicitly attributed the existence of firms to the co-existence of similar and complementary activities; see Ravix (2002).

At the more macro-level, it could be argued that Penrose's work anticipated the recent revival of interest in 'increasing returns' (see, e.g. Arthur, 1989) and also the focus of macroeconomic theories of 'endogenous growth' of management, human resources, technology and innovation and 'increasing returns' (see, e.g. Lucas (1988) Romer (1986, 1994) and for a critical account, Fine, 2000). Not only are the themes similar and anticipated by Penrose, but in addition her approach was arguably more complete. For example, increasing returns (or at least not diminishing ones) are to be found in traditional manufacturing activities—not just the (mainly knowledge-based) activities, on which recent literature focuses.

Concerning its impact, in one sense the book's timing could not have been better. In the late 1950s there were important contributions in the Bain (1956) tradition of Industrial Organisation (IO) (for example, Modigliani, 1958). Alfred Chandler was working on his *Strategy and Structure* (Chandler, 1962), Stephen Hymer was completing his 1960 dissertation on the multinational, and, of course, there was the great discussion of the 'managerial revolution' and the managerial theories of the firm (Baumol, 1959, 1962; Williamson, 1964; Marris, 1964), see also Slater (1980). Penrose choice of issues was very close to Chandler's and Hymer's (see Pitelis, 2002) and Bain's influence in the book is clear.[12]

The Bain–Modigliani work was then the only game in town in neoclassical IO circles, and it would be very surprising if the TGF had the early recognition it had in the absence of the 'managerial theories' and Marris', in particular. Marris (1999) gives his personal account of the relationship between Edith Penrose's and his own seminal contribution and book (1964). For us the essence of the story is this. Managerial theories depended on the assumption of separation of ownership from management, with managers managing but also acquiring firm control. Assuming that managers' objectives diverged from owners' and that the former had a preference for growth and size-related variables (not short run profit *per se*) different theories of the firm could follow (for example Baumol's sales revenue maximisation and Williamson's discretionary expenditures) with different implications to the short-run profit maximisation neoclassical model.

These two are neoclassical-type static comparative equilibrium models of rational utility maximising agents.[13] (Different is the utility function and the ensuing equilibrium.) All these have little to do with Penrose. However, the focus is on similar issues, firm objectives and (in Marris) growth. This might have helped Penrose's book gain some early notoriety in the context of that discussion. This contributed to the recognition of the 'Penrose effect' later to be incorporated in wider neoclassical models of growth (on which see Slater, 1980; Foss, 1999; Penrose and Pitelis, 1999).

PENROSE AND BUSINESS STRATEGY

Following the emergence and rise of the resource-capabilities/knowledge theory of the firm and the resource-based perspective in business strategy, Penrose's work has become a standard reference—indeed she is arguably seen by some as the mother figure of this perspective (much like Michasel Porter had become for the 'positioning'/industry-centred view). In this context, the influence of TGF on business strategy has been beyond doubt very great indeed, and will not be revisited here (see, for example, Foss, 1999; Kor and Mahoney, 2000; Pitelis, 2002).

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A current dispute, instead, focuses on the extent to which Penrose's book was influential in the early resource-based contributions; some like Barney (see Rugman and Verbeke, 2001) believe it was not, even that it should not (Rugman and Verbeke, 2001).

In brief, as discussed in Foss (1999) and Rugman and Verbeke (2001), among others, at least a variant of modern resource-based theory is about rents in equilibrium, which is far from Penrose's main theme. However, and as we have already mentioned, the last part of the book, that deals with the issue of firms size, artificial barriers to entry, etc., as well as her references to 'impregnable bases' can be interpreted in 'rents in equilibrium' terms. In chapters 7 and 11, Penrose explicitly dealt with conditions that can engender rents, both at (quasi-)equilibrium and (even) at dis-equilibrium we coin the term 'rents in dis-equilibrium' in order to describe Penrose's discussion of 'impregnable bases'. This discussion appears in Chapter 7 of her book on 'The Economics of Diversification'. Penrose's main point is that for firms to survive in a dynamic changing environment they need to develop an 'area of specialisation', 'a foothold', 'a productive base' or 'technological base' (p. 109), a 'basic position' (p. 123) or 'relatively impregnable bases' (p. 137). For Penrose, firms seek

> the development of a particular ability and strength in widely defined areas which will give them a special position vis-à-vis existing and potential competitors. In the long run the profitability, survival, and growth of a firm does not depend so much on the efficiency with which it is able to organize the production of even a widely diversified range of products as it does on the ability of the firm to establish one or more wide and relatively impregnable 'bases' from which it can adapt and extend its operations in an uncertain, changing, and competitive world. It is not the scale of production nor even, within limits, the size of the firm, that are the important considerations, but rather the nature of the basic position that is able to establish for itself. (p. 137).

Moreover,

> if one examines closely the established firms with a long history of successful growth, and in particular, the genesis of their product diversification, one will find that their strength lies in the fact that they have established and maintained a basic position with respect to the use of certain types of resources and technology and the exploitation of certain types of market. Although they have rarely confined themselves to a narrow range of products, they have exploited the economies of production, organisation, and growth, and have taken advantage of monopolistic and quasi-monopolistic market positions, in a small number of fairly well defined areas. The characteristic strength of the large, well-established firm does *not* (emphasis in the original) derive from a miscellaneous collection of resources in many fields, but from the fact that it has 'defences in depth', as it were, in a few special fields. (pp. 137–138).

These and other similar references suggest explicitly that, for Penrose, not only firms can enjoy rents in dis-equilibrium but in fact if they do wish to do so they have to make a particular use of their resources and their competences, such that it provides them with a 'relatively impregnable base'. Clearly, the very term 'impregnable' points to 'isolating mechanisms' and limits to imitability. In this sense, Penrose did not underplay the possibility of rents in dis-equilibrium. Save for her focus on analysis, not prescription, she almost advocated them—or at least felt that for firms to enjoy such rents they required 'relatively impregnable bases'. Importantly, this is seen by Penrose not to contrast with her focus on value-creation.

As the second quote above hints, Penrose did not fail to also deal with monopoly and quasi-monopoly rents. Penrose eschewed from the equilibrium concept, and explicitly rejected neoclassical price theory, as relevant in dealing with her concern, growth.[14] However, she recognised clearly the possibility of monopoly and monopolistic restrictions, generating (mostly transient in her view) rents in what one could call quasi-equilibrium. Extensive discussion of her ideas on these issues appear mainly in chapter 11 of TGF. In this chapter Penrose deals explicitly with the issue of monopoly. She draws on the work of Bain (1956) (precursor to Porter's (1980) approach to strategy), discussing 'barriers to entry' to include 'artificial' ones (p. 230) and refers to 'first mover' advantages in the context of a 'theory of headstart' (p. 257) which can allow large firms to create and maintain 'dominance'. She suggests that large

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firms cannot at all times take advantages of all productive opportunities available in a growing economy, which leads to 'interstices' in which small firms can operate and themselves enjoy the benefits of growth. Importantly, large firms do have an incentive to use 'monopolistic restrictions' to enjoy 'rents'. For Penrose

> Here is the basic dilemma: competition is the essence of the struggle among the large firms that induces and almost forces the extensive research and innovation in which they engage and provides the justification for the whole system; at the same time the large firms expect reward for their efforts, but this expectation is held **precisely because competition can be restrained.** (p. 264) (emphasis added).

It is clear from the above that Penrose did not just deal with, but explicitly believed that the possibility of monopoly rents was there. She did not consider this to be inconsistent with value creation, but the result of the potential inefficiencies of quasi-equilibria achieved through large size. Yet, she explicitly favoured efficiency (value creation) to monopoly (value appropriation), both in analytic and empirical terms.

Analytically she suggested that

> A strong case can be made for the fig firm and for 'big business' competition, especially with respect to the rate of development of new technology and new and improved products, ... (p. 260).

To summarise, for Penrose, firms create value, but also try to appropriate value, both at (quasi)equilibrium (monopoly) and at dis-equilibrium through building impregnable bases. Value creation and value appropriation are part and parcel of firms' attempts to make maximum feasible long-term profits. Indeed firms create value with an eye to appropriating as much of it (and value created by other firms) as possible. While dis-equilibrium rents were strongly advocated, monopoly rents were felt to be ineffective for firms and inefficient for the economy as a whole. Despite the above, there is little question that 'rents in equilibrium' was not Penrose's main theme and interest. It is arguable (indeed rather clear) that the 'rents in equilibrium' variant of the resource-based view has not been influenced by Penrose. While this helps establish a claim to originality, we believe these theories could have been better, had they been influenced.[15]

Besides the (direct or indirect) criticisms mentioned above, Penrose's contribution has been criticised more extensively. Penrose has conceded some such criticisms, notably by Robin Marris concerning the role of finance, and revisited some issues, e.g. her treatment of growth and profits, in response to such criticisms (see Penrose and Pitelis, 1999).

There are two more criticisms of resource-based ideas that we wish to discuss here, no less because they come from two figures whose views currently inform two major 'competing' perspectives to Penrose's on firm (strategy)—Porter (1999) and Williamson. Both have dealt with resources and competences more recently in Porter (1999) and Williamson (1999). Porter is largely dismissive, the main reason being what he sees as vague concepts. Williamson has wider-ranging critiques, a major one being the apparently tautological nature of the perspective and the lack of operationalisability and supporting evidence.[16]

Penrose's contribution has not been criticised as tautological; this would have been absurd. The predictive and prescriptive aspects of her theory are both operationalisable and testable, and they have been operationalised and tested. This answers Williamson's critique too on this front. For Kor and Mahoney (2000) the persistence of critiques on operationalisation and evidence is just misinformed. They cite an extensive list of empirical studies that test and mostly support the Penrosean views.

Williamson's reference to operationalisability and evidence is a familiar one; he has made similar comments on the 'power' perspective (Williamson, 1996). The reason we wish to pursue this issue just a fraction more, is because we believe that Porter's own work refutes both Porter and Williamson, but also, and most importantly, because we believe that most of the available evidence is still seriously limited, for which we agree with Williamson that more and better operationalisation and empirical work is needed on all fronts.

Concerning first the critique on evidence, it should be noted that, considering the length of time during which resources/competence-based ideas have been around, they have not done badly on this front, see Kor and Mahoney (2000). It has arguably taken longer for transaction costs to start becoming operationalised and tested, and this is

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not surprising. Resources, especially tangible ones are operationalisable directly and to some extent, intangible assets too (for example through data on patents). The case with transaction costs is more difficult, as extensive empirical work had to await the introduction of separate concepts, leading to transaction costs, by Williamson, e.g. asset specificity. This is a more roundabout method of testing the implications of transaction costs, and it is worrying that no less than Coase (1991) himself, but also Demsetz (1995) have expressed doubts on the ubiquity and importance of Williamsonian asset specificity. Concerning our point on Porter (1987) he had written, we think, a classic article on conglomerate diversification, which in many respects is the best available test of the Penrosean theory of diversification! The prescriptive implication of Penrose's theory on this is to diversify where there is perceived evidence of the applicability of existing resources to the new venture. By transferring knowledge (thus skills and competences) there will be value added. Porter's study provides empirical support to the claim that by transferring skills and by sharing activities, diversification can add value and succeed.

The finding itself, and even the terminology (skills, activities) are almost as Penrosean as one can go. Clearly there are resource-based aspects in Porter's other contributions, for example, in the *Competitive Advantage of Nations* (see also Foss, 1996), but also his recent work on clusters. On clusters, too, Penrose's theory is of essence, and Porter's evidence arguably in support of her views. Richardson's (1972) classic conceptual foundation of clustering explicitly built on Penrose. Indeed seen in this context of knowledge generation, informing decisions about cooperation and clustering, the Penrosean relevance on clusters is even more important, see Pitelis and Pseiridis (forthcoming). We feel Porter should read Penrose. Given his qualities for prescription, and notwithstanding critiques, such as Grant's (1991), we feel this could serve both.

Where we side with Williamson is the nature of the evidence. What we crucially need now is to operationalise power, Porter-type, transaction costs and resource/knowledge-based ideas and test them simultaneously in the same general estimated-econometric framework. There has been precious little progress on that. A reason is that most authors tend to test for their preferred theory. This, however, is totally inadequate, if (as it is the case more often than not) different theories can lead to the same prediction. Which theory has the highest explanatory power? Unless one sees both coefficients, one's support for one's own theory's implications means next to nothing, just that one has no reason to reject one's hypothesis. What if other hypotheses have similar implications but even higher explanatory power? We will simply not know, until we proceed to the type of empirical work.[17]

SOME LIMITATIONS AND GENERALISATIONS OF TGF

Seminal as it is, Penrose's contribution does not fully address a number of important issues. In this section, we focus on what we consider the most important of these and explore the input (and limitations) of other contributions in organisational economics by means of reaching points of common ground that can hopefully serve as a background for some generalisations and creative synthesis.

The first has to do with the issue of knowledge-related intra-firm advantages. These are always taken by Penrose to lead to growth. This is not self-evident. As Penrose herself pointed in her original 1955 paper that preceded TGF and included its main points, there is always the possibility of selling the resources-advantages. Intriguingly, despite mentioning the possibility, Penrose did not pursue this further. The issue remains (and of course is well debated in the literature), why not sell your (intangible) assets in the open market? One has to return to some sort of 'market failure' argument to address this, either natural (transaction costs-related) or structural (fear of creating a competitor) or tacit knowledge-related, or any of these. Clearly, the argument can also be phrased in terms of differential capabilities; i.e. firms are better in making use of their own assets than other firms (i.e. the market!). One can read arguments by Buckley and Casson (1976), and Kogut and Zander (1993), plus the importance of oligopolistic interaction (now recognised by most, Pitelis, 2002) in this context.[18] Penrose did not discuss transaction costs arguments in the book. Oligopolistic interaction is part and parcel of her story—yet is not explicitly discussed in the context of 'why not sell'.

A second, related, limitation refers to the question why not shed excess resources, e.g.

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labour. Penrose deals with the issue by claiming that she focuses on growing firms in a growing economy. This is all very well, but even successful firms in a growing economy may choose to shed excess resources, rather than use them for further expansion. While excess resources may have zero marginal costs, the costs of thinking what to do about them could be immense—as it is the time by the management that has to do the thinking, see also Marris (1999). In this sense, the issue is not so straightforward as it may appear in first sight. Shedding excess resources (labour, middle-level management) is not only an option; it is one that has been used extensively in the 1990s despite this being a period of unprecedented growth. Clearly this issue, too, needs further discussion.

A third limitation has to do with a broad category of issues related to what is now called 'agency', moral hazard, 'monitoring', residual claimants and the like. The literature on these issues is huge, notable contributions being Alchian and Demsetz (1972) and Jensen and Meckling (1976). In brief, the issue here is that whenever there exists a 'principal–agent' relationship, like for example employer–employee, or shareholder–manager, and when the interests of the two parties are not *ex ante* fully aligned, agents may have discretion to pursue their own interests. When this is the case, it becomes important for principals to devise means for aligning the incentives of employees to their own.[19] Besides Alchian and Demsetz, and Jensen and Meckling, managerial and behavioural theories of the firm are based on similar concerns. Managerial theories, as already suggested, rely on different utility functions by managers, plus control on their part, thus the ability to pursue non-profit (including growth!) objectives. The behavioural theory goes further, in suggesting the pervasiveness of conflicting objectives by different groups within firms, which, alongside bounded rationality, questions the very sacred cow, the profit motive. In view of conflicting intra-firm interests, and bounded rationality, 'satisficing' is more likely to be the firms' motive, see, e.g. Cyert and March (1963).

There is little of that in Penrose. Indeed there is no conflict of any kind within the production process. While it is clear that no-one can deal with all issues, we believe her analysis could be usefully enhanced by allowing some of these issues to enter it. In part this is because intra-firm divergence of interests can itself be a source of endogenous innovation and growth, as it motivates management (principals more generally) to devise (creative) means of addressing the problem.[20]

In addition to the above, and while in TGF intra-firm there is only co-operation, this is not to be found inter-firm. The main form of inter-firm co-operation allowed in TGF is the standard neoclassical one of price collusion. In his 1972 classic, George Richardson showed how the Penrosean framework could be used to explain inter-firm co-operation. Richardson's focus was not on knowledge-creation through inter-firm co-operation (i.e. the Penrose story), as one might have expected; instead he focussed on the division of labour between alternative means of organising production, i.e. market, firm and co-operation. He built explicitly on a Penrosean statement, to claim that the firm emerges when similarity (defined in terms of same underlying resources) and complementarity of activities co-exist. For dissimilar activities we have markets, for complementary but dissimilar activities we have co-operation.

Richardson's contribution is monumental. It goes beyond both market failures and differential capabilities, and provides a production-based explanation for both 'market-organisational failures' and differential success. This complements Penrose, but also the transaction costs, and all other stories.

Besides the aforementioned 'limitations', and indeed building on (some of) them, we can also propose some generalisations of Penrose, as follows. First, the Penrosean contribution does not require pre-existing excess resources, for the arguments to follow. Second, it does not require the pre-eminence of management. Third, the recognition of intra-firm conflict can be of use in generalising the Penrosean insights of endogenous innovation-knowledge-growth, see Odagiri (1992), and help in part explain its direction. Last, we believe the Penrosean view can be generalised by incorporating in it insights and definitions from other contributions.

Concerning excess resources and building at the time on important insights by Babbage, Sargent Florence, and others, Penrose (1955, 1959) considered it normal to expect excess resources to be present in all but very large scales of output, for reasons related to 'balance of processes', indivisibilities of resources, etc. All these are relevant but

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not strictly required. Penrose can be generalised even by starting from a hypothetical situation of no excess resources and just observing knowledge generation within firms. This suffices. Indeed the very observation that human beings (and some machines) have ever-present unrealised (brain) potential will do. In effect, organisation aids potential, which (activates brainpower and) releases resources. All other arguments are sufficient but not necessary conditions for the Penrosean story to follow.

The second theme is management. We believe the Penrosean focus that management is the human resource par-excellence to be a product of its time, and not totally necessary or useful. To explain, let us first look at the other human resources, notably the labourer and the entrepreneur, even the (venture) capitalist. For Marx, but also Adam Smith and the classics, and for often-different reasons, the human resource par-excellence is labour. In the classics, because of the labour theory of value—all value is created by labour so labour has to be the most important human resource. For Schumpeter, the hero is the entrepreneur. Take the entrepreneur out and all you have is semi-idiotic masses who would do precious little. So who creates wealth is the hero, and this is the entrepreneur. Even venture (for some vulture) capitalists are somepeople's heroes. Exit them, and so many good entrepreneurial ideas would be just that, ideas. The above point to the pre-eminence of all human resources. Management's importance, and the 'Penrose effect', follow with no difficulties. Positing management's pre-eminence is not needed for the Penrosean story to follow. Motivating, monitoring, rewarding, upgrading and maintaining talent is the name of the game. This is the old theme of extracting labour from labour power, work from work potential but with a twist. You may now need to bend yourself backwards to exploit some people's potential, and sharing part of the 'residual' is one way.

The third issue we wish to explain by way of generalising Penrose, is that of intra-firm conflict. This, we feel, is of essence to the Penrosean story.

Penrose's approach was to look at the outside environment by first looking at what she called the 'nature' of the firm. She went on to posit a dynamic interaction between the internal and the external environment. In this context, it is clearly in line with her own focus to look at intra-firm competition. As already discussed, this can take many forms and apply to many groups. Clearly, however, the conflict par-excellence is that between employer–employee (Marx, Alchian and Demsetz, etc.). Recognising this can help Penrose in various ways. First, it provides an extra reason for thinking by entrepreneurs-management of how to address this—which is innovation-knowledge generation. Second, it helps explain/predict, at least partly, the direction of this thinking. Last, but not least, conflict can lead to creative tension, and thus be a source of new information and knowledge.

The last issue we wish to consider is that of the very definition of the firm, in general, and the capitalist firm, in particular. As pointed out in Pitelis (1991), even in books with the title in them, the term capitalism is rarely defined. Defining capitalism as *production of commodities by means of commodities (e.g. labour power), under administrative co-ordination by one human resource (entrepreneurs) over the other human and non-human resources, for production for sale in the market for profit*, helps generalise the Penrosean (and Coasean) definitions of the capitalist firm. As in Penrose, the capitalist firm is a bundle of resources, administered-controlled by one such resource that produces commodities for a profit. The generalisation is afforded by the term commodity (products produced explicitly for exchange, already implicit in Penrose's view), and the concept of control of employers over employees, to include intra-firm conflict.

The focus on 'commodities' and the employer-employee relation are clearly classical themes. While the 'commodity' has all but disappeared from conventional analysis, the employment contract and intra-firm conflict have not been, as we discussed already.

The absence of intra-firm conflict and 'agency' from the Penrosean story, might in part explain (or be explained by) her focus on successful firms. For Penrose, problems are there to be solved, and are (being) solved. Those who do not solve them, fail. The focus, however, is on those who succeed.

CONCLUDING REMARKS AND IMPLICATIONS FOR MANAGERIAL PRACTICE AND PUBLIC POLICY

By bringing in issues of endogenous knowledge, innovation and growth, human resources, the role of 'image' and 'productive opportunity' and the

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dynamic interaction between internal and external, agency and structure, Penrose went well further than existing (organisational) economic theories to provide what we consider the first economics-based, yet interdisciplinary, organisational theory of the firm. Penrose's view of firms as organisations, aiding the generation of knowledge, provides a new perspective on firms, but also organisations and institutions at large. Her theory serves as the glue that binds together, including economic and organisational theories of firms, organisations, institutions, and (business) strategy. Importantly, Penrose's work has significant implications for managerial practice and public policy, including their interrelationship.

Starting from management practice, Penrose's work was analytical, not normative or prescriptive, and she advocated no managerial practice of any kind whatsoever. Having said this, she actually felt that 'rent', of both the monopoly type and through the building of relative 'impregnable bases' was important for the success of firms. Whilst monopoly power and rents could give rise to short-term success only, the building of relatively impregnable bases was important for the long-term successful expansion of firms.

The building of 'relatively impregnable bases', however, is itself predicated upon the successful redevelopment of resources, competences and other advantages, in a dynamic changing environment. In such an environment, the key to long-term success was to build technology bases through perennial innovations through knowledge creation and by internalising the Schumpeterian process of 'creative destruction'. In her words:

> The Schumpeterian process of 'creative destruction' has not destroyed the large firm; on the contrary it has forced it to become more and more 'creative' (1959, p. 166).

There is a clear message for management practice from that, which is also very good for practice, namely perennial innovation.

Besides the useful, and good for practice, policy prescriptions that derive from Penrose's work, similarly useful prescriptions good for managerial practice and importantly consistent with it, can be derived vis-à-vis public policy and practice. Penrose's views are in contrast to conventional neoclassical thinking on public policy. According to such thinking, the route to heaven (maximum consumer welfare) passes through the door of 'optimal industry structures' called 'perfect competition', or 'perfect contestability'. The main feature of such industry structures is the freedom of entry, costless exit, and zero rents in equilibrium. Departures from such ideal structures effected through monopolistic practices, such as collusion, strategic entry deterrence etc., should precipitate public action aimed to re-establish the ideal industry structure.

Quite apart from difficulties in so doing and the evident possibilities of 'government failures', 'perfect competition' and 'perfect contestability' are both inconsistent with and even inimical to dynamic intertemporal efficiency, i.e. innovations. This rather forceful statement is made by no less than Baumol (1991), the very proposer of contestable market theory (Baumol, 1982). This, Baumol claims, is because these two 'ideal' types of industry structure remove the very incentive to innovate, the Schumpeterian pursuit of (transient) monopoly rents. Instead for Baumol (1991) all evidence suggests that it is neither the giants nor the 'midgets', but intermediate-sized firms involved in a competitive process, that are best suited for innovative activity.

The above are in line with Penrose's support for 'big business competition', acting as an external stimulus to innovations (in addition to internal stimuli discussed), in an environment with no 'artificial' restrictions to small firms growth in 'interstices'. Restrictive practices are bad for social welfare, and bad for large firms too, as they can only succeed in the short run. Enlightened business practice and suitable public policy can guard against such practices, not in order to harm but for the benefit of big business, and the economy at large. Public authorities, in this context, should not aim at identifying and effecting 'optimal' industry structures, but in providing the appropriate institutional context for 'big business competition', alongside small business creation, that leads to value creation through innovations. Such an approach to public policy is clearly more consistent with, and good for, good management policy and practice.

To conclude, Penrose views provide useful insight for good managerial and public policy practice in a way that emphasises value creation through innovative activity effected through internal and external stimuli to growth and innovation. These prescriptions, moreover, are mutually

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consistent. This is in contrast to neoclassical thinking which views any departures from perfect competition-contestability with suspicion. For Penrose, the building of 'relatively impregnable bases' is a conscious departure from competition-contestability, as it creates dynamic barriers to entry, yet it is crucial for the success of firms and the economy at large. The dialectical linking of value creation and value appropriation, dynamic efficiency through innovations and rents in (dis)-equilibrium points to the more comprehensive, all-embracing and internally consistent world-view of Penrose's, than is, even today, current in the extant literature in economics and (business) strategy.

NOTES

1. This includes learning by doing; to work with others; to re-combine resources; learning what, how and why; learning to learn; hopefully learning to unlearn; learning oneself; and more generally as ancient Greek philosopher and legislator Solon put it 'getting on always learning'.
2. These are complex ideas, hard to formalise in conventional models. This could explain the limited success in formalising Penrosean ideas and also the reason why her ideas have become so influential in fields of enquiry that involve less modelling, e.g. organisational economics and business strategy (see below).
3. Resource allocation and creation are related. For example, a change in resource-allocation can lead to resource-generation. Yet, there is a difference in focus between the two perspectives (see below).
4. It is not clear, however, as to whether Penrose and Richardson are dealing with the same issue here. It is our hunch that Penrose herself would not have any quarrel with Richardson's arguments. Her focus was on the neoclassical model of the firm; i.e. of price-output decisions under assumptions concerning (static) profit maximisation, and different types of (rather unrealistic) industry structures. This, we would agree with Penrose, is harder to combine with a theory of dynamic firm growth of her type.
5. When one considers the devastating critiques of this perspective by, among others, Hayek, Schumpeter, Young, Keynes, Sraffa and (in business strategy) Porter (1999), it is hard not to agree with Caldwell (2000) that the dominance of the neoclassical perspective is a mystery.
6. Abandoned, however, in Rugman and Verbeke (2002).
7. The problem is the scope. Such theorising can serve as a shortcut to not addressing the fundamental issue of dynamic co-ordination and growth in part at least due to the serious difficulties in formalising the complex ideas involved.
8. An important aspect of this insight is the endogenous incentive to make profitable use of 'excess resources'. This is more subtle and powerful than the exogenous profit maximisation motive. While the two are related—the latter in part motivating the former—making productive and profitable use of employed resources is a challenge, because it can help upgrade the resource, because of the personal opportunity cost of inability to delegate, and for numerous socio-psychological reasons not accounted for by an exogenously imposed profit motive (note, however, that Penrose had such a broader explanation for the profit motive itself). Crucially the very process of thinking what to do about the resources one employs, is itself innovation-(equals) knowledge.
9. How one can be boundedly rational and still get it always right in integrating, and only if in so doing one reduces market transaction costs by more than one increases intra-firm transaction (managerial, administration) costs, has always defied me.
10. Transaction costs clearly enter the story if one suggests that in their absence one could conceive of contractual means of addressing the problems. To claim, however, that transaction costs is the main reason, as opposed to the tacitness and public goods aspects of entrepreneurial ideas, is not evident at all.
11. These and other themes focussing on functions and/or characteristics of firms, such as co-ordination, culture, identity, continuity of association, learning etc (see, for example, Demsetz, 1988; Kogut and Zander, 1996) cannot explain by themselves the *differentia specifica* of the firm either. All these functions and/or characteristics belong to varying degrees to other institutions too, including the market. For example, there are clearly all of the above-mentioned, and more, in a University; yet this is not a firm. Some arguments apply to different institutions and organisations, the family, the church, the market, too.
12. Bain is explicitly mentioned in the book. The affinity of her work to Chandler's was recognised later in her preface to the 1995 edition.
13. For Penrose's influence in neoclassical thinking more generally; see Slater (1980), Penrose and Pitelis (1999). In advising Penrose on how to deal with such developments in the second edition of her book, Fritz Machlup writes in a letter to her, in 1978, that this 'task is a little more demanding. Particularly in your case where the mathematicians picked up the ball that you had thrown, and run away with it in all possible directions'.
14. In a now famous quote, Penrose chose not to quarrel with the theory of the firm as part of the theory of price and production 'so long as it cultivates it own garden and we cultivate ours' (1959, p. 10).
15. For illustration purposes, consider the recent critique of Barney (1991), by Priem and Butler (2001a,b), that, among others, the 'Barney-type resource-based view' has exogenous value and no theory of the firm. Barney (2001) admits the

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exogenous value point, and cites himself (Barney, 1991) in evidence that he had been aware of this. Now Penrose's theory is if anything at all, exactly about endogenous value creation! In addition, her perspective lends itself to a theory of the firm, as discussed. If so, I see little reason for the quarrels. I also see the potential tension between growth (and value creation) and rents in equilibrium, as a variant of the issue of growth and allocation-coordination I discussed earlier in a wider context. What I said there is of input to this current debate. Both value creation and 'rents in equilibrium' can have their uses, but I believe the latter's use can be better appreciated if one's starting point is value creation.

16. Porter does not refer to Penrose and it is unlikely he has read the book Williamson's critique seems to be reinforcing Porter's and both need to be addressed. The issue of tautology is also explicitly dealt with in the discussion between Barney and Priem and Butler. I believe Barney is effective in countering this criticism. He refers to other apparent tautologies, including Coase's, and claims that the issue is whether one can provide operational context and testing of hypotheses to the apparent tautologies. We agree Allyn Young's famous 'tautology' (that the division of labour is determined by the division of labour) is clearly not a tautology at all, if one has the theory to explain how.
17. This is needed even for variants of the same theory. Take the case of the literature on the multinational firm. As explained in Pitelis (2002, Chapter 8), there are at least three transaction costs-related explanations of why foreign direct investment (fdi) versus market-type modes of entry. To test which is better you need fdi on the left-hand side of an equation and (proxies for) the (three or more) competing determinants (specific assets, public goods-type intangible assets, intangible assets with tacit knowledge dimensions) on the right-hand side. We have nothing of the sort yet. This is probably the main reason why all theories persist and each is able to claim star status.
18. Whether one wishes to call this 'market failure' or 'differential capability', I believe is a semantic issue; the two are essentially the same. For example, Penrose herself explained vertical integration in terms of firms' differential ability to produce for their own needs. In part, she attributed this to difficulties in communicating to others a firm's exact needs. This can be interpreted as (dynamic) transaction costs due to tacit knowledge, or differential firm capabilities in transferring intra-firm tacit knowledge.
19. In the Alchian and Demsetz story, the question is applied to the very issue of obtaining the productivity benefits of the employment relationship and it is used for a conceptual justification of the need for private ownership and control of firms. Specifically, it is observed that in any team effort, shirking is likely to occur due to difficulties with measuring individual outputs. To ensure productivity is not thus prejudiced, there is needed a monitor of team-workers. However, the monitor needs to also be monitored. To avoid an infinite regress situation, it is best if the monitor is self monitored, by becoming a residual claimant of any surplus left after expenses to other members of the team, etc., are paid.
20. A perspective that built on principals' efforts to have their own way, through devising appropriate institutions and organisations, has been fruitfully adopted by North (1981, 1991). The present author (1991) has independently adopted the same heuristic to explain the genesis, growth, relative advantages and failures of capitalist institutions. Neither North nor I had anything reminiscent of endogenous innovation and growth (other than the Marxian notion of labour-saving technological progress, in my case). This is only partly endogenous and fails to deal with the far broader Penrosean story.

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