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Competition

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ABSTRACT

Edith Penrose and Josef Steindl each developed a distinctive analysis of the growth of firms. They undertook to understand the process that was leading to increasing dominance of industry, particularly manufacturing industry, by a small number of large firms. In the present paper, we examine the work of these two authors to detect similarities and differences in the way they deal with the determinants of firm growth and the implications of such growth for the competitive struggle amongst firms.

Our particular focus is on the divergent conceptualisations of the notion of capacity between Penrose and Steindl, referring to the quantity and quality of productive services from management with experience within the firm in the case of Penrose and to the quantity and quality of physical assets (particularly machinery) in the case of Steindl. We examine the internal logic of each conceptualisation, as well comparing motivations and implications. Our appraisal is that they both provide coherent, but partial, explanations of the forces driving firm growth. We trace the difference in their explanations to different empirical bases motivating each author's analytical schema. This leads us to suggest an encompassing explanation that focuses on overcoming any of a variety of bottlenecks, including managerial capability, productive capacity and market development, which can impede a firm's ability to grow.

1. Introduction

The neoclassical theory of the firm as developed from Marshall (1961) and continued in current microeconomic textbook treatments (for example, Varian, 1996), has emphasised the derivation of optimal firm behaviour and competitive equilibria among firms. The function of the firm is reduced to a type of mechanical adjustment to operating consistently with the solution of conditions for profit maximisation. Firms do much more than this in a non-trivial sense. In this paper we develop a different path from Marshall to explore interactions between firms and industries in economic development.

Firms require substantial information about their immediate industrial and market settings, an environment beyond this and their own internal organization in order to decide the direction of adjustment in their operations that might enhance profits. So our starting point is the supposition that firms are learning organizations. Much of this learning is by doing and in the process of doing firms sometimes discover new ways of doing things, so that firms occasionally innovate. Most importantly, firms undergo internal development in the process of learning, innovating and adjusting their operations in what are intended to be profitable directions. We argue that a general theory of firms and competition should include consideration of this internal development, so that the neoclassical theory is at best incomplete. The internal development of firms has implications for the competitive relations between firms, so that a general theory of firms and competition that allows for internal development also yields a dynamic theory of competition.

Around the middle of the 20th Century, research published by Josef Steindl (1945a, 1945b and 1976 [originally published in 1952]) and Edith Penrose (1995 [originally published in 1959]) examined the internal development of firms. While neither author's work has been embraced by the neoclassical mainstream of economics, they each have had followers who have built on their seminal contributions. Penrose's work stimulated a spurt of research on firm growth models from the 1960s (see, in particular, Marris, 1964, 1999) and is now widely cited in the literature on firm capabilities (see, for example, Dosi, et al, 2000, Kay 1997 and Loasby, 1999a). Steindl's work is arguably the foundation for the modern theory of monopoly capitalism (see Baran and Sweezy, 1966 and Cowling, 1982), as well as stimulating more directly derivative work (see Mott and Shapiro, 2005).

Rather than argue for further developments of the analysis of either Steindl or Penrose in isolation, we argue that their approaches to understanding the internal development of firms are complementary and that, taken together, their work provides a solid foundation for a general theory of

firms and competition. By “general”, we mean that this theory that could be used to examine conditions for either static or dynamic equilibrium, as well as for analysing the processes of firm growth and the competitive struggle amongst firms. So, such a theory would be general in the sense that it would encompass analysis of the process by which firms develop internally towards idealised types, along with the analysis of their behaviour in equilibrium as ideal types.

A striking similarity in the work of Penrose and Steindl is the rejection of the equilibrium determination of the size of the firm by forces outside the firm’s control. In the analysis of competitive equilibrium, technology in the form of diseconomies of scale limits the profitable size of the firm, while with equilibrium under imperfect competition, the buyer market is a constraint on the size of firms (as in the influential work of Sraffa 1926 and Young 1928). Penrose and Steindl both accept the general existence of economies of scale (or economies of size) and treat firms as having the potential to overcome external constraints, usually formulated as emanating from buyer markets.

Rather than impose external limits on the size of the firm through technology or the demand established in buyer markets, Penrose and Steindl both focus on internal constraints to the growth and development of firms. Further, there is an interesting parallel in that for both authors growth in any given period provides the platform for further growth in subsequent periods, so that the limits to growth recede with time and growth is in some sense self-generating. Finally, in the analyses of both Penrose and Steindl there is a possibility that firm growth ceases, but this outcome depends very much on the internal development of the firm, with external factors playing only a conditioning role.

While Penrose and Steindl both utilise an internal constraint as limiting firm growth, they clearly differ in identifying the nature of the internal constraint. Penrose (1995) emphasises limits to managerial capability, while Steindl (1945a, 1945b, 1976) emphasises limited access to finance. They also have distinctive internal mechanisms for loosening these constraints, devoting managerial services to the training and integration of additional managers in the case of Penrose and internal accumulation of productive capacity through retained earnings in the case of Steindl. Thus, while in some sense a limited capacity to expand production is the bottleneck that limits firm growth in both Penrose and Steindl, they differ markedly in terms of the measure of capacity and the means of expansion.

In this paper, we focus on the divergent conceptualisations of the notion of capacity between Penrose and Steindl, referring to the quantity and quality of productive services from management having experience within the firm in the case of Penrose and to the quantity and quality of physical

assets (particularly in terms of embodied technology) in the case of Steindl. We examine the internal logic of each conceptualisation, as well as comparing motivations and implications. We argue that both Penrose and Steindl provide coherent, but partial, explanations of the forces driving firm growth. This leads us to suggest an encompassing explanation that focuses on overcoming any of a variety of bottlenecks that can impede a firm's ability to grow, including managerial capability and productive capacity of equipment.

We begin our analysis by examining the context in which Penrose and Steindl develop their analyses. In particular, in Section 2 we focus on their reactions against the neoclassical propensity to use the autistic device of the representative firm and only analyse development at the level of the industry rather than the firm. In Section 3, we then discuss the analysis of internal development as presented in Steindl (1945a, 1945b, 1976) and in Penrose (1995). This leads us to a discussion of the way ahead for a general theory of firms and competition in Section 4, followed by some concluding remarks.

2. Critical developments of the Marshallian-cum-neoclassical theory of the firm

Penrose (1995) and Steindl (1945b) each reject neoclassical explanations for the size of firms. Indeed, they focus differently on the issue of the growth and development of firms. While their rejections differ in detail, both authors rebel against the determination of "ideal" or "representative" firm size.¹ Instead, they each argue that the current size (and prospects for future growth) of a firm depends on its past growth experience, which is in turn a result of its own internal development. Further, they are each cognizant of heterogeneity in the history and circumstances of individual firms, which leads to the

¹ A theory of firms and competition is not about determining the realised or idealised and optimal boundaries of the firm that is discussed in a strand of industrial organization research emanating from Coase (1937), Simon (1976) and Williamson (1975). The explanations are of the firm's boundaries given stable and well-known assets. There is no role for an industry in these explanations as the theories tend to focus on the firm rather than firms, and their treatment of competitive processes is implicit. Although the part of this research that has focused on joint ventures, beginning from a presumption that a subset of two different firms' assets are of mutual interest, but cannot easily be exchanged with the aid of markets, has similarities with Marshall's industries (Kay, 1997). The main focus though of the efficient boundaries programme has been on selecting between markets and the firm's hierarchy as a means of ensuring the efficient formulation and completion of exchanges subject to the minimization of transaction costs. Langlois (1992, 2002) unites elements of the agenda of industrial development set out in this paper with selecting an appropriate institutional form in a tripartite comparison of maintaining an activity within its current firm, contracting out an activity to a supplier, and ceasing an activity in recognition that a rival firm can undertake the task more efficiently. Langlois considers costs of learning, teaching, codifying, training and explaining as crucial in the collaborative and competitive transferring of activities between institutional forms.

existence of a distribution of firms over a potentially large range of sizes and capabilities. Marshall looms large, at least implicitly, in the analysis of each author.

Penrose is thoroughly Marshallian without really referring to Marshall (Loasby, 1999b). Her analysis of the development of productive knowledge is carried out primarily within firms, while giving some additional credence to resources that are close-at-hand to firms. This is the closest that Penrose gets to industries, and even this is more focused on connections of exchange (although not ongoing interaction) between firms than on categorical distinctions based on the criterion of shared productive techniques. In fact, Penrose goes much further than Chamberlin (1933) in freeing her analysis, and so her heterogeneous firms, from the conflation of firms and industry in Marshall's representative firm. Her heterogeneous firms are not even anchored to particular markets or industries (Penrose, 1995).

In *Principles of Economics* (1961, pp. 302-304), Marshall devotes some pages to joint stock companies and to the specialist task of management, and in *Industry and Trade* (Marshall 1921) refers to firms with ongoing accumulation of capital and knowledge, supported by scientific managerial techniques (Whittaker, 1999). A second volume of *Principles* was not written, and so the descriptive, informal and evolutionary or developmental insights in *Industry and Trade* have rarely affected later scholars' readings of the more formal analysis of *Principles* (Comin, 2000; Raffaelli, 2004). While "it all could be in Marshall", we are still devoting time and resources to deciphering what the "it" is or "its" are. Part of the problem is in applying Marshall's insights to the subsequent changes in corporate form; changes that are supported by the co-evolution of scientific managerial techniques, stock markets, and legal regulation of corporate governance, which he recognised but did not bring within his formal or informal arguments.²

Penrose (1995, p. 2) is clear in her rejection of there being a firm size that is somehow best: 'It is often presumed that there is a "most profitable" size of firm and that no further explanation than the search for profit is needed of how and why firms reach that size. Such an explanation of the size of firms will be rejected in this study'. Penrose (ibid.) goes on to state that, 'it will be argued that size is but a by-product of the process of growth, that there is no "optimum", or even most profitable, size of

² Raffaelli (2004, p. 210) argues that Marshall had a coherent and general theory of development or evolution, encompassing deliberative innovation and systemic selection and reproduction among innovations, embodied in repeatable or autonomous routines that exhibit tendencies of inertia.

firm. As we shall see, traditional theory has always had trouble with the limits to the size of firms, and I think we shall find the source of the trouble.'

In the theoretical discussion of the determinants of firm size, Steindl (1945b, p. 3) starts by criticising Marshall's (1961) use of the "representative firm", noting that according to Marshall, 'The limitation to the size of the representative firm, to sum up, is due to the limits of the market and, is obviously assumed, to the large scale economies becoming less important from a certain size on.' This view of the determinants of firm size is somewhat more flexible than the strict "most profitable" size of firm rejected by Penrose. However, Steindl (1945b, p.10) still rejects it, arguing instead for the coexistence of both small and large firms with a '*general* advantage of the bigger firm.' (italics in the original).

Marshall's explanation of economic development depends on firms being roughly similar in size and accumulative capacity being constrained by the domination of external over internal economies, supported by a perceived lack of vigour in managerial capability. Steindl addresses the coexistence of near-monopoly capital alongside entrepreneurial and small businesses. In effect, Steindl is dealing with the consequences of Marshall's inability to have large firms disregarded.

Three related issues are discussed in the remainder of this section: (1) the role of Marshall's representative firm in his overall explanation of economic development, (2) the tension between internal and external economies, and (3) the aspects of on-going corporations and internal accumulation of capital and knowledge that do make their way into Marshall's less formal analyses. This then leads into a discussion of the positions of Steindl and Penrose on these issues.

Marshall's overarching argument is that industries rather than firms are the basis of economic development. Knowledge dissipates through economies in localised industries, which act as industrial colleges with knowledge being 'in the air' (Marshall 1961, p. 217). In contemporary terms, knowledge leaks out and is communicable with a good deal of personal contacts among rivals, suppliers, training institutes, customers and so on. While the effective communication of productive knowledge cannot be taken for granted, there are channels of communication or of understanding and firms need to be co-located and participate to benefit. Innovation is gradual, and though there is some brief internal accumulation that might allow one company to get a start on others, assumed leakage means that internal accumulation is just enough to provide brief incentives on a piecemeal basis. There is little chance for the internal accumulation of innovative capability (understood as an indirect or higher-order

capability) as this resides to a significant extent in an industry that includes the industrial college among its functions. So firms build on others' contributions with as much likelihood as building on their own contribution. Innovations might as well be undertaken through random draws, as in the more formal simulation of economic development in industries by Nelson and Winter (1982).

The implication of this brief sketch of Marshall's explanation is that economic development needs industries as well as firms, and as distinct and interacting units and levels of analysis. Firms are irreducibly heterogeneous but within narrow bounds. Further, the bounds are secured in principle if not in fact through the domination of processes of internal economies by external economies. Marshall's view of firms, which provides essential grounding to his explanation, is empirical, though it may have become less valid empirically as conditions changed during the late 19th Century and beyond.

Despite irreducible heterogeneity among firms in often localised and clustered industries, the tendencies that prevent one firm getting a lead and benefiting from faster accumulation or internal economies mean that the famous representative firm of Marshall's *Principles* has some (logical) credence or tractability. Despite Sraffa's (1926) critique, and much discussion in the realms of imperfect and monopolistic competition, primarily Marshall's representative firm represents the industry (Loasby, 1978). It can represent the industry because of the limited variation across firms in the industry, in part caused by the flows and leakages of ideas in industries, in part by the lack of opportunities for capital accumulation, and in part by limits in managerial scope.

Variation among firms, and also bounds on these variations, is inferred from each firms' presumed built-in expiry date. These expiry dates are connected with an intergenerational model in which family firms form, flourish and decline. Third-generation managers are presumed not to have acquired the personal motivation, commitment and vigour, so do not enthuse their employees with similar drive, commitment and vigour, leading to malaise and failures to acquire new knowledge and techniques or failure to build upon these if acquired (Marshall, 1961, p. 299).

Marshall's (1961, pp. 315-316) 'trees in the forest' metaphor brings the industry to the fore and establishes dynamic balance between progressive and declining firms, with today's progressives inevitably becoming tomorrow's decliners. So Marshall can reasonably impose his formal model of the representative firm as a caricature of the industrial structure and processes, which themselves can be described as in equilibrium for the industry (Sutton, 2000).

Of course, Sraffa (1926) is correct. Marshall's assumption of rising costs for the representative firm (especially in the short period), and so by Sraffa's inference all firms, as if they are identical, equally well informed, numerous and facing an identical demand, is arbitrary. Without Marshall's (1961, pp. 298-300) (implicit) closure or boundary condition of firms with built-in three-generational deaths, the process of accumulation together with down-sloping cost curves over normal zones of production, even for one firm, leads to the break down of the industrial system. Internal economies come to dominate external economies. That is, firms with lower costs can devote resources to Schumpeterian process and organisational innovations as well as to innovations in products and physical capital, so that firms with lower costs no longer receive random innovation draws (but systematically biased draws in their favour), with similar effect. Even if knowledge is still "in the air", other members of the community now find it a bit harder to make sense of, as the many small steps of connection start showing gaps, requiring bigger leaps among potential imitator-innovators, or leaps that require the devotion of more and more accumulated resources (Cantner and Pyka, 1998).

The tension of internal and external economies is explained clearly in Young (1928). Young distinguishes internal and external economies, and places the more radical innovations outside his industrial system, captured in the form of external effects. Radical innovations are always outside the system of the firm in focus. They might not even arise within the industry/market system of focus, but could be – as with Steindl – in the form of exogenous increases in demand (or far-off demand and innovation). If there is radical innovation within the industrial system of focus, but not emanating from the particular firm of focus, any gains become available to all firms in the industry very quickly almost as free reductions in cost or increases in demand. The transition from these near-exogenous or environmental changes (which implicitly are understood only vaguely at first) and their near-automatic capture in firms is the transition from thinking of external economies, which could also be manifest as internal economies if firms differ in their understandings of what was hitherto an exogenous effect. Somewhere in this transition, the economies are captured systemically and can be described as changes in scale.

Young (1928) describes the capture among firms of external economies in prosaic terms, implying similar rather than then different and uneven understandings among firms. The most clearly understood part of economic development for Young, drawing from Marshall and also Smith, is also the part that features incremental changes, as firms adapt to production at a larger scale through

adapting their internal managerial procedures to new means of production, seemingly seamlessly. Given that Marshall's explanation of economic development is framed by the representative firm in a basically competitive industry (dynamically more than statically), firms' adaptive changes are straightforward. Adaptation could even be as in Steindl, with firms in a different or counterpart industry producing higher-order industrial goods (fixed capital), with exchanges with firms in a focal industry being characterised by simple connections, and with the capital goods being easily applicable and absorbable for firms working at similar levels of productive and absorptive capacity.³ In short, changes in scale are established somewhere else and most firms adapt quite easily, perhaps with opportunities arising for new entrants to replace those firms that lack the motivation and vigour to do the adapting.

The Marshallian framework betrays Marshall's pedagogic strategy in exposition of selective attention and focus, particularly in placing difficult questions to one side (especially from a general equilibrium perspective, but here from an industrial dynamics and economic development perspective too). The improvements to productivity are acquired easily and leak from a related industrial system or subsystem. Otherwise, if they emanate from the industrial system or subsystem of focus, we face the awkward question of why nearly all firms in this system absorb the external changes easily but no one firm initiates any innovating activities of a more radical nature. Marshall's own answer is to invoke time, but again firms' reactions must take approximately the same time (Marshall, 1961, pp. 274). This also places the changes in the context of an industry's markets and of firms' industrial marketing endeavours, rather than of industries in themselves. The means of transition are orderly so that most firms can adapt the changes from elsewhere without too many problems.

There are clear connections in Young's (1928) explanation with that of Steindl. Steindl inherits Young's understanding of Marshall's distinction between internal and external economies, but includes capital market imperfection, greater variety among firms in an industry codified as variation in asset size, and indivisibilities in innovation in capital goods produced in different or counterpart industrial systems, and connected simply with firms within the industrial system of focus.

In contrast, Penrose has no clear pattern of internal economies and external economies, probably because the idea of "external" to her is everything that is beyond the firm and its immediate

³ "Higher-order" is used in the sense of Menger (1976, p. 56): 'a large number of other things in our economy that cannot be put in any direct causal connection with the satisfaction of our needs, but which possess goods-character no less certainly than goods of first order.'

network pattern of close-at-hand connections. However, she includes approximately freely available productivity improvements for the firm in her explanation. It is just that they emerge idiosyncratically as part of the firm's growth as her category of "economies of growth". In some respects, these economies of growth fulfil a comparable function as Marshall's external economies, and also share some but not all of the characteristics of external economies.

Penrose still has a "representative firm" in that she writes generally of "a growing firm" in order to explain processes that are presumed to be common to all firms that are pursuing growth, but not determining in any particular case, and elsewhere publishes case studies of Holden Motors and Hercules Powder Company (Penrose 1956, 1960). Penrose's (1995) argument presumes generality and so representativeness in processes but not in outcomes, so this is a different and perhaps more abstract level of generalisation. All firms that seek to grow have the same general processes, but have idiosyncratic historical paths, resources, and managerial experience informing how productive services are drawn from combining the set of productive resources. Hence, free productive resources, which Marshall termed external economies, are still "in the air", but there is a very limited group of individuals, including managers of the particular focal firm and perhaps other firms included in a "close-at-hand" network, which are in a position to devote other resources to interpreting and assimilating these, or which have opportunities of interpreting and assimilating these.

Where most of Marshall's firms could absorb external and more or less free improvements to productivity quite easily, Penrose's growing firms need managerial competence (which cannot be hired at short notice and with immediate effectiveness) and other resources to capture and direct the economies of growth, which are available episodically. There is an autonomous element, in that existing activities (so selected in previous episodes) become routine, providing the freeing up in the first instance. The freeness is in the form of resources, awaiting a transformation into productive services directed and augmented by managerial attention, and so at a different level augmenting of managers' abilities.

Marshall has some references to scientific management, mainly in *Industry and Trade* (details). Whittaker (1999) provides a stimulating discussion. As argued above in this section, scientific management is one part of the big firm's story, which, if admitted by Marshall into his theoretical system, would undermine his explanation of economic development based on industries. Marshall's (1921, p. 315) most telling remark is where he considers that it might be feasible for a firm to take over

large amounts of economic activity, but that no one firm had demonstrated sufficient vigour and longevity, or had access to sufficient capital, for such an undertaking. Once again, Marshall is forced into having to rely on a phenomenon associated with the family-owned firms of the 19th Century to deal with the modern corporation that is already taking hold at the beginning of the 20th Century (Penrose, 1952, p. 805). Neither Steindl nor Penrose accept this escape.

3. Constraints on firm growth

Having moved away from the neoclassical strand of Marshall's theory of the firm with its emphasis on the determination of optimal firm size in equilibrium, Penrose and Steindl are each left with the task of developing an alternative theory.⁴ Here, they share an aversion to following the neoclassical emphasis on the role of techniques of production (in terms of economies and diseconomies of scale) and market demand (in terms of imperfect competition leading to downward sloping demand curves). Instead, they each emphasise an internal factor that limits the growth rate of firms.

For Steindl the key factor limiting the firm's internal development and growth is access to finance. Entrepreneurs demand a risk premium on investments with uncertain returns to compensate for exposure to bankruptcy and loss of control associated with variance in returns.⁵ This means that ability of firms to expand their productive capacity through the acquisition of additional capital equipment is limited at any point in time.

Steindl (1945a, 1945b, pp. 13-18) recognises that opportunities differ for small and large firms for undertaking risk-bearing activities in order to acquire higher rates of return, because economies of scale tend to raise the return to large units of capital above that of small units of capital. This advantage is somewhat offset by the difficulties of expansion in an imperfectly competitive market, but is reinforced by a reduced cost of borrowing for larger firms (Steindl, 1945b, pp. 18-21). However, Steindl then argues that there is a scarcity of firms controlling large units of capital. This limits the

⁴ The significance of the boundaries of firms and industries in our outlining of a general theory of firms and competition differs from that in Coase (1937), Simon (1976) and Williamson (1975). In particular, we draw from the analysis of social systems and also subsystems, especially in the sense that boundaries at any one time capturing the sense of ongoingness for firms and industries. Following Steindl, firms can be considered subsystems within industrial systems. Given our understanding in this paper of firms and of industries being predicated upon the development of knowledge, systems are means for agents of tolerating uncertainty. They are sites for the embedding of general routines, given particular contingencies. Given uncertainty, it is difficult to say which configuration of boundaries is more efficient, or that even if boundaries are drawn so as to minimise transaction costs, this will be helpful in providing agents with a sense of ongoingness.

⁵ Steindl's argument concerning the relationship between the variance of return and the risk premium closely follows Kalecki's principle of increasing risk (Kalecki, 1937).

overall expansion of firms and ensures that the returns on those opportunities available only to large units of capital are not competed down to a normal rate of return. There is no such scarcity of firms controlling small units of capital. Entrepreneurs who control large units of capital are therefore able to earn differential rents (Steindl, 1945a, p. 44).

Steindl applies his analysis of the differential rents between large and small firms to examining trends in concentration by linking access to capital with the investment strategy of firms. In the simplest case, Steindl argues that firms expand their capital over time through internal accumulation, which involves saving all those profits earned in excess of interest payments and dividends and reinvesting in expansion of productive capacity in their current products. He further assumes that small and large firms have an equal propensity to save (Steindl, 1945a, p. 33). When large firms earn a higher rate of return than small firms do, they grow relative to small firms through a faster rate of internal accumulation. Without entry of new firms, this leads to relative concentration in the industry in terms of a rising share of economic activity for large firms.

Alternatively, large firms use their advantageous position to choose a lower risk exposure than that of small firms (Steindl, 1945a, pp. 32-33). In this case the rate of disappearance of large firms due to bankruptcy is less than that for small firms. The disappearance of small firms can lead to concentration of industry that is absolute in the sense that the rise in the share of large firms is accompanied by a fall in the sales of small firms as a group. Absolute concentration is further encouraged if the rate of profit for the whole economy is constant or declining. In this case, the rate of profit for small entrepreneurs will definitely be falling; leaving more of them exposed to bankruptcy (Steindl, 1945a, pp. 37-39). Also, there will be no incentive for entry of additional small entrepreneurs.

While there is no explicit consideration of the role of the industry or competing firms in *Small and Big Business*, Steindl does note that part of the reason for the continued existence of small firms is the development of imperfect competition in industries through the relative and absolute growth of large firms (Steindl 1945b, pp. 59-60). Under oligopolistic conditions, the existence of small firms is enhanced as 'big firms which have established themselves as price leaders there have in most cases little to gain from the elimination of small firms that account only for a small part of total supply' (Steindl, 1945b, 60). Here, Steindl assumes a type of oligopoly equilibrium, which he later comes to treat as a special case of "maturity".

Explicit consideration of the role of the industry and competing firms becomes central to Steindl's dynamic analysis of competition in *Maturity and Stagnation in American Capitalism* (Steindl, 1976).⁶ Here, Steindl continues to argue that there is a general advantage to large firms due to economies of scale. However, this is now combined with technical progress that brings improvements in productivity that occur at an uneven pace across firms in the same industry to yield differences in the level of production cost, even among firms in the same size class. This differential technical progress combines with economies of scale as the basis for differential rents applying to firms within the industry (Steindl, 1976, pp. 37-40).

Firms with differing levels of production cost can coexist in the same industry due to imperfect competition, which leads to a general tendency towards price rigidity (Steindl, 1976, pp. 14-17). When prices are rigid, cost-reducing innovations lead in the first instance to an increase in the gross profit margins of the innovating firms. If the level of excess capacity for the firms with lowest unit production cost is within acceptable limits, these "progressive" firms have no incentive to cut prices. This allows high-cost firms, which are small or technologically backward, to survive, even when these "marginal" firms do not gain access to the cost-reducing technology.

Steindl maintains the argument from his analysis of risk that investment by firms is in the form of internal accumulation. Higher profits earned by progressive firms therefore lead to the expansion of their productive capacity relative to marginal firms. Eventually, the progressive firms become the largest firms in the industry. If the number of marginal producers is constant, the industry is subject to relative concentration in the sense of a faster rate of growth and growing market share for the limited number of largest firms (Steindl, 1976, pp. 40-42). However, a sufficiently high rate of growth of industry demand may attract new entrants, who are small and relatively high-cost firms, thereby postponing the onset of relative concentration.

Introducing technological progress into Steindl's analysis loosens the constraint on firm growth caused by limited access to finance without accepting undue risk. When technical progress raises the profits of progressive firms, there is an increase in the rate of internal accumulation and rate of growth for these

⁶ Steindl follows the standard practice of statistical agencies, particularly the US Census Bureau, and defines industries in terms of common or overlapping production technology. This definition is appropriate in terms of Steindl's focus on scale and adoption of best-practice technology as sources of cost advantage for firms in an industry, but ignores potential competition between products with competing uses that are produced using different production technologies.

firms. However, unplanned excess capacity eventually emerges with the rate of growth of industry capacity rising to eventually exceed the exogenously given rate of expansion of industry demand.

Initially, progressive firms react to this unplanned excess capacity by engaging in aggressive price or selling competition. Marginal firms cannot match the aggressive competition due to their smaller gross profit margins, so that they are forced to cede market share to the progressive firms. In some cases, they are bankrupt and exit the industry. Also, the reduced gross profit margins dissuade entry of new firms into the industry. Concentration of the industry is absolute in the sense that, with the decline in the number and size of the marginal firms, there is a decline in the total sales of small firms and a rise in the total sales of large firms (Steindl, 1976, pp. 42-43).

Steindl's progressive firms are able to overcome the external constraint on growth posed by market demand growth below their rate of internal accumulation through the use of aggressive competition. However, this aggressive competition reduces the profit margins for themselves as well as for competing firms, hence reducing the rate of internal rate of accumulation and the rate of firm growth throughout the industry. Thus, the external environment influences firm growth, but only in a way that is intermediated through the development process firms and of the industry. This is most clearly indicated when Steindl suggests that the increasing industry concentration eventually leads to an abatement of internal accumulation by the progressive firms, who recognize that there is no possibility of squeezing enough sales from the remaining competing firms to maintain growth in sales that is equal to the rate of internal accumulation (Steindl, 1976, pp. 53-55).

For Penrose the factor that limits the internal development and growth of the firm ultimately is the capacity of its management. Penrose (1995, p.48) argues that, 'Since the services from "inherited" managerial resources control the amount of new managerial resources that can be absorbed, they create a fundamental and inescapable limit to the amount of expansion that a firm can undertake at any time.' Penrose's view is of firms as repositories of resources, which include items of fixed capital alongside intangible resources of knowledge and routines, from among which managers can select and configure plans in the form of connections of productive services.

Penrose states that her analysis only applies to a select group of firms, namely those firms that 'are enterprising and possess competent management' (Penrose 1995, p. 32). Here, she follows Steindl in recognising that among heterogeneous firms there will be some that are particularly important in the

analysis of growth and development. This contrasts sharply with Marshall's careful formulation of the variation among firms in his "trees in the forests" analogy.

Where Steindl assumes that owners and entrepreneurs only invest their accumulated earnings in the same industry, Penrose provides reasons, rather than assumptions, for reinvestment in the firm itself, as the firm's resources are the outcome of a unique growth trajectory and so are path-dependent. In other words, additional resources are of value as productive services only in a complementary and intangible connection with a firm's established productive services drawn from established resources. However, Penrose notes that the best employment of these productive services may be in areas outside the firm's current area of specialisation, defined either in terms of technologies or markets (Penrose, 1995, pp. 109-111). Thus, diversification is central to the internal development of firms in the analysis of Penrose and at the same time destabilising of any clear identification of industry.

Firm growth, for Penrose as for Steindl, is a staccato process in which the firm adjusts to the changing context partly created by its own growth activities. Growth requires resources, especially managerial resources, and these have to be absorbed and configured with established resources into a range of existing and new productive services. Once an episode of assimilation and growth beds down and becomes a normal activity, these now integrated resources of growth are freed up for further expansion. Indeed, Penrose (1995, pp. 99-102) writes of "economies of growth" (distinct from economies of size or scale), which are specific to growing firms, transient and available only during a phase of growth.

Penrose understands the relationship between firm, market and industry, though in fuzzy terms (1995, pp. 107-108). All growing firms have unique or heterogeneous bundles of resources from which managers configure sets of productive services (1995, p. 77). Further, firms sell in markets by undertaking necessary spending efforts in which repeat custom and loyalty are again features, and she emphasises further that a firm's resources are not tied to a particular market (1995, pp. 116-118). For Penrose, firms have fewer limits on their productive and marketing possibilities, mainly because a "technological resource base" can be drawn upon in processes of diversification, and also because a market can support products which require different resource bases. Where Steindl's industry provides an immediate selection environment and limit to firm growth, these limits are considerably more relaxed in Penrose's analysis. This difference is though of degree and not type. There are still limits over given time periods in the "stretchability" of a firm's technological resource (or competence) base.

4. The way forward to a general theory of firms and competition

The neoclassical theory of the firm assumes that all firms are operating optimally, minimising production costs for their chosen product quantity and quality and choosing other aspects of their operations to maximise profits. The corresponding theory of competition specifies the possible equilibria among a group of such optimally positioned firms. Normally all firms are assumed to be identical or it is assumed that their individual behaviour can be appropriately analysed by dealing only with the “representative firm”.

Steindl and Penrose both reject this idealised approach to the theory of the firm and competition. Their analyses are realist in orientation, starting from the proposition that firms develop over time in ways that tend to contribute to lowering their costs and improving their profit positions. Given a theory that imposes optimality throughout, such development would be possible only in the trivial sense of continuous adjustment to external developments, such as exogenous technical progress. Further, both Steindl and Penrose recognise the existence of differences among firms, especially differences due to starting from unequal positions and from not being equally adept in realising the possibilities open to them. In short, firms are not operating optimally and vary in the degree to which they approximate any abstract notion of optimality.

A general theory of firms and competition following Steindl and Penrose would incorporate the internal process of development among firms. The tendency towards reduced costs and increased profits would be part of what the theory explains, rather than assume internal development away through the idealised approach of neoclassical theory. This theory would recognise heterogeneity among firms as an essential starting point, with heterogeneity driving firms along different growth trajectories.

The analysis could proceed by emphasising the role of an elite subgroup of leading firms, such as the “progressive” firms in Steindl’s analysis or the firms that are “enterprising and possess competent management” in Penrose’s analysis. These leading firms should be able to grow regardless of technology or market demand, albeit within the limits set by access to finance, as in the analysis of Steindl, or the availability of managerial services, as in the analysis of Penrose. Furthermore, the growth process would have a self-reinforcing tendency, such as occurs through the acquisition of

capital equipment with improved technology for Steindl or the continual freeing up of managerial services for further growth projects in the case of Penrose.

As in Steindl and Penrose, but unlike in neoclassical theory, the growth of firms would not be limited by external factors of technology or demand. Rather, as in Steindl's analysis, the impact of technology would tend to support continued growth of leading firms through economies of scale, learning by doing and the acquisition of new technology embodied in capital equipment (see Bloch 2005). Also, as in Penrose's analysis, firms would use their self-generated surplus managerial services to expand into related products and markets, overcoming potential limits imposed by the growth of demand for current products.

Does this mean that the growth of firms would be unlimited in a general theory of firms and competition? Here, Steindl and Penrose give different answers. Steindl argues that absolute concentration is an inevitable outcome of the internal development of leading firms. With absolute concentration comes industry maturity, a situation in which the leading firm or firms recognise that further internal accumulation at a rate exceeding the growth of demand among buyers connected with the industry would lead to excess productive capacity rather than a continued growth of market share. In this situation, the leading firms choose to limit their internal accumulation to the rate of growth of market demand and, in that sense, firm growth becomes limited (Steindl, 1976, pp. 53-55). Note that it is a conscious choice by the leading firms to limit growth, rather than the direct working of some market mechanism, that puts the brake on firm growth.

Penrose takes a different position. She argues that managers are constantly assessing opportunities in the contexts of their acquired experiences for diversification into related markets, including backward or forward integration through extending the production chain. When faced with the prospect of having to undertake aggressive competition to increase market share in their existing product markets, firms will normally choose to pursue one or more opportunities for diversification within its existing "areas of specialisation" or seize on the possible use of its existing expertise in a new area as a means of utilising otherwise free managerial services (Penrose, 1995, pp. 109-111).

A general theory of firms and competition would encompass the possibilities identified by both Steindl and Penrose. In effect they are offering different strategies to the firm in dealing with an emerging intensification of competition within existing product lines. Steindl's insistence that firms confine their expansion to their established products is unnecessarily confining, whereas Penrose's

avoidance of intense competition through diversification is too sanguine.⁷ The choice of strategy by a particular firm would depend on external market circumstances and technology, but also on its prior internal development, particularly on the degree of enterprise built into its management and the precise nature of the capabilities the firm establishes through activities such as marketing and industrial research.

Sorting out the strategies of leading firms for continued growth at rates exceeding the rates of expansion of their current product markets would provide a fundamental component of the general theory of competition. In addition, it would be necessary to consider the reactions of existing firms outside the leading group. Both Steindl and Penrose allow for the continued existence of such “small” firms, but only in limited circumstances such as at the margins under imperfect competition (Steindl, 1945b, pp. 59-62) or in market interstices (Penrose, 1995, pp. 223-225). A somewhat more optimistic analysis of the possibilities for laggard firms is contained in the analysis of Downie (1958), where he introduces the notion of an “innovation mechanism”, whereby managers of laggard firms have a greater incentive (the need to survive) to undertake risky research and development work that might provide them with ways to re-establish their competitive position.

A general theory of firms and competition would need to incorporate a more systematic analysis of “small” firms, especially in relations to large firms producing what buyers consider to be comparable products, than is contained in the work of either Steindl or Penrose. Downie’s analysis could provide a starting point for dealing with incumbent small firms. In addition, it would be necessary to include treatment of entrepreneurial firms. Here, Schumpeter’s analysis of entrepreneurial firms (Schumpeter, 1961) and his analysis of “creative destruction” (Schumpeter, 1950) provide a logical starting point.

5. Conclusions

Marshall recognises the existence of heterogeneity among firms, but treats this as inconsequential to his theory (his famous “trees in the forest” analogy). Neoclassical theory has followed this path, leading to the assumption that all firms operate optimally at all times. In contrast, Steindl and Penrose develop

⁷ In the limit, large firms would necessarily occupy dominant positions in all important markets, meaning that further expansion beyond the rate of growth of market demand would be possible only through a competitive struggle for greater share in some market. This struggle would presumably extend across national as well as industry boundaries, so that competitive struggle among diversified multinational firms is an ultimate constraining influence on the growth of individual firms.

realistic theories of the firm, emphasising the role of internal development within the firm, at least among leading firms, that leads to the growth of the leading firms along with improvements in their cost and profit performance over time. We argue that a realist approach following Steindl and Penrose could provide the foundation for a general theory of firms and competition.

A general theory of firms and competition based on Steindl and Penrose would provide the mechanism for analysing the internal development of firms along with the implications of internal development for the nature and intensity of competition. Such a theory would be of substantially greater scope than the corresponding neoclassical theory, which deals primarily with idealised firms, consistently operating in an optimal manner, and with the cooperative or non-cooperative equilibria that might exist among such firms. The idealised state of the firm is never achieved in practice nor is equilibrium observed. More importantly, the activities undertaken by firms in the course of their internal development fundamentally alter the firm and its competitive relationships, as well as providing innovations that lead to technological progress. By considering the course of internal development of firms, a general theory of firms and competition could provide us with propositions regarding the way in which firms are expected to develop over time and the implications of this development for the intensity of competition. Thus, a general theory of firms and competition would necessarily adopt an evolutionary perspective.

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