



**THE BROKEN THREAD: MARSHALL,
SCHUMPETER AND HAYEK ON THE
EVOLUTION OF CAPITALISM**

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Introduction

In this contribution I propose to explore some of the foundations of an evolutionary approach to economics. Rather than rely on recent scholarship I shall consider the writing of three important Western economists, Marshall, Schumpeter and Hayek in the light of evolutionary theory. In particular, I shall suggest that these very diverse writers are linked by a thread of evolutionary reasoning made evident in their treatment of the dynamics of economic development its connection to innovation and economic adaptation to innovation and, more deeply, to the link between wealth creation and the growth of knowledge. Within the canon of modern economic thought that thread is broken. It turned out that while Marshall explicitly invoked evolutionary reasoning in his Principles, published in 1890 with revised editions through to 1920, his followers systematically eliminated all traces of this dynamic from the body of economic theory. Schumpeter and Hayek too wrote in evolutionary terms but remained out of the mainstream. Yet the writings of this triumvirate provide the basis for a theory of general evolutionary economics. Of course, modern evolutionary economists certainly acknowledge a debt to Schumpeter in this regard, they should acknowledge too the contributions of Marshall and Hayek in providing the foundations of evolutionary economic dynamics.

What is at stake here is no mere quibble over terms with mainstream, neoclassical economics but a thoroughgoing difference of view into the nature of modern capitalism and its development. Ideas in relation to equilibrium states, competition, institutions, the role of knowledge are deeply contested and I shall try to show why these differences matter through a consideration of the work of Marshall, Schumpeter and Hayek. They matter in particular in relation to our understanding of economic change. The undeniable claim that capitalism has never been stationary but that its development is spatially and temporally very uneven is the central historical fact of economic life (Landes, 1968, 2002; Mokyr, 1990, 2002). The argument we pursue here is that the development of economic activity in all its different forms is inseparable from the growth of knowledge, boosted by emergence of organised science and witness to immense economic transformation. What is it about capitalism as a system that has made this possible? The answer is that these features arise because it is an evolutionary system, with its instituted rules of conduct to promote the search for and application of new knowledge in order to challenge and transform the prevailing disposition of activities and resources. How to represent this in our economic thinking is the question

that Marshall, Schumpeter and Hayek addressed in very different but complementary ways. I should perhaps add that in the following I take a semantic view of theories in economics. To theorise is to abstract and the abstractions are not one-to-one maps of the real phenomena they are designed to explain, yet the design is false if no connecting correspondence principles can be found to connect the abstraction with reality. It is in the specification of what constitutes the relevant isomorphism that controversy usually arises. A relevant example, will be discussed below in terms of the concept of a stationary state, certainly an abstract model but one that has no connecting links to the world of capitalism or so Marshall, Schumpeter and Hayek have us believe.

Evolutionary Reasoning

A very brief statement on the nature of evolutionary reasoning is necessary at the start. Evolutionary systems are dynamic systems and evolutionary reasoning is reasoning about the origins of change of becoming not of being (Witt, 2003). Historically it has had two broad meanings, one in terms of the progressive path dependent unfolding of entities, the developmental view, and the other, the process of variation and selection leading to differential growth and structural change, the population view. In the history of evolutionary thought the two views are often competing but the sure conclusion is that they are complementary. Development contributes to explain variation and variation is the fuel on which selection is empowered. If we take an economic activity as our starting point an evolutionary approach would identify where the activities differ and where they are members of the same population because they are subjected to common causal processes. Marshall and Schumpeter, of course, work in terms of populations of firms with each firm different by virtue of the different business models that they espouse. Three broad categories of events lead to a changing population structure, the entry and exit of entities and the differential growth of entities, these are the fundamental phenomena of evolution and in economic terms they are deeply connected with processes of innovation and market adaptation. To these processes of population change we add processes of the development of the entities so that the pattern of variation is continually redefined. Thus evolution is a three stage process, of

given variation, of selection acting on variation, and of the further development of variation.¹
How does this idea of evolution connect to the triumvirate?

Schumpeter

It is appropriate to begin with Schumpeter, the acknowledged father of modern evolutionary economics. His central vision of the dynamics of capitalism was set out in the Theory of Economic Development (1912) and remained substantially, but not entirely unaltered through Business Cycles (1939) and the post war articles that provide such a convenient summary of his position (1947 a&b). It is in all its essentials a variation cum selection model of economic change although Schumpeter never expresses the fact in this way. Like Marshall, but with a different intent, he separates the model of a stationary or even a regularly expanding economy, which in Schumpeter's case comes from Walras, from the reality of capitalist development for to invoke a stationary capitalism, is to invoke a contradiction in terms. Schumpeter's capitalism is not a system in equilibrium but one which through entrepreneurial action and adaptation to that action is continually transformed, and the manner of its transformation is evolutionary in the senses described above. Evolution is not change *simpliciter* but rather change that involves either or both of two separate causal logics, one based on the idea of an unfolding of interconnected possibilities and the other based on a population dynamics of differential growth. In Schumpeter's scheme the nature of economic activities evolves through time as does their relative importance so that over extended periods of time the details of how economic activity is conducted may come to share little in common. This is the high theme of creative destruction; a term which, it is significant to note, has deeper origins in German 19th century economic thought (Renart and Renart 2005, Santarelli and Pesciarelli, 1990; Streissler, 1994).

To summarise what is already well known, Schumpeter's source of variation is entrepreneurial activity defined as the introduction of novel ways of conducting economic activity, a process which we might term the formulation of business experiments for short. Such innovations are the source of economic variety on which the competitive process operates to evaluate the new and adapt to the novel, according to the relative advantages that the new ways possess over the old ways. This is a theoretical scheme that makes a distinction

¹ I have explored the structure of evolutionary economic theories in a number of places, particularly, Metcalfe 1998, 2005 and 2007.

between creative action or response and adaptive action or response contingent on whether or not innovation, “the doing of new things or the doing of things that are already being done in a new way”, is entailed (Schumpeter, 1947a, p.151). Part of the story is about the conditions of innovation and the kinds of innovation in play, the other part is about the way in which patterns of coordinated economic activity, whether in organisations or markets respond to the potential changes latent in any innovation. Evolutionists would recognise this as a classic selection process in which the relative fitness of different economic methods, old and new, are jointly determined and jointly adapted too, for the prevailing economic arrangements always provide the environment in which the new can be tried and tested. Not all innovations need succeed but those that do have passed a test of profitability and whether they are new forms of textile machinery or a new caviar product the dynamics of adaptation is the same. The differential profit advantage of the new attracts investment in the form of imitation by less adventurous business minds thus increasing the supply of the relevant class of commodity or service. In so doing, the system of output and input quantities and prices is transformed until the entrepreneurial profit is eliminated. As he famously put it profit “is at the same time the child and the victim of development” (1912, p.154). This variation cum selection perspective shades too into the evolution as unfolding perspective. Innovations are rarely fully developed when they first appear but rather offer up a space for exploration through further innovation to define a sequence of trajectory of related developments, a theme which is by now standard fare in the innovation literature (Dosi, 1982; Utterback, 1994). How this sequence is realised is not independent of the context in which the innovations are commercialised and spread so the two perspectives of a development trajectory of related innovations and of a process of competitive selection of different innovations become intertwined. All of this fits together as a supply side story. Indeed, one of the curiosities of Schumpeter’s approach is that consumers, households that is, are treated as passive recipients of the innovations coming from new firms, no creative response for them. This is not only a gap in his reasoning, consumers, as matters of fact, do innovate in finding new uses for products often unanticipated by their designers and innovators, but it is also internally inconsistent to ignore the fact that firms are consumers too and that any innovation has consequences for the demand for inputs including the products of other firms.

From another perspective this is a model of knowledge based economic transformation. Innovation as business experimentation is always a conjecture about a hypothetical, alternative economic structure. The carrying into effect of that conjecture depends on scarce

leadership qualities within the new enterprise and in relation to the mobilisation of resources to bring it into being and overcome the manifold liabilities of newness (Metcalfe 2006, Witt, 1998). In the process, new economic knowledge is generated and it is the awareness of that new information that stimulates others to follow as imitators. So Schumpeter's capitalistic dynamic is crucially a knowledge and information dynamic a point of considerable significance when we turn below to Hayek. However, the new knowledge in question is not only, perhaps not even, a matter of high science and technology. Invention is not innovation, technology experiments are not business experiments, and in a telling phrase, the innovation "need not be of spectacular or of historic importance", the humble innovation is quite essential to the business process (1947a, p.151). Over time Schumpeter's sense of the agency that performs the entrepreneurial function extended from the creative individual to the corporate team but in all cases it required the imagination to conceive of possible alternate economic worlds, as well as leadership and the sure calculation of possibilities. Corporate innovation, whatever its merits in terms of access to superior resources to innovate may be fatally compromised by the conflict between leadership and bureaucratic action that can be characteristic of large firms. Indeed it may but not necessarily, nor need the large firm dominate the process completely. It is a gap in the approach that inadequate recognition is not given to the opportunity that radically new technologies may give to the traditional, individual entrepreneur, as the modern world of innovation in internet and bio medicine currently illustrate. No matter what is the precise form of entrepreneurial agency, capitalism is not a system to preserve the status quo but rather a self transforming system in which transformation of knowing and transformation of activity run hand in hand.

One of the strengths of Schumpeter's approach is that his scheme of innovation is grounded in wider considerations. The innovation may meet hostility from incumbents because the gains to novelty are losses to tradition and so it is essential that the system is sufficiently open to accept the challenge from novelty. Capitalism cannot be conservative in its actions even though it must be conservative in its framing rules. The rules of the decentralised market process certainly facilitate openness and adaptation to innovation but even they may need supplementing by regulatory action to prevent the suppression of enterprise. It is here that Schumpeter alighted on a matter of the greatest importance, that business experimentation is an investment that requires resources to be committed in anticipation of results. This is not the financing of routine working capital but rather the financing associated with the incalculable uncertainties carried by emergent novelty, for which no offsetting assets can be

offered by the entrepreneur to compensate for failure- such assets are yet to be created. Schumpeter's identification of the role of capital and credit in funding and filtering emergent novelty is one of his major contributions to the understanding of innovation: no matter that he may have misunderstood the facts of innovation finance in Austria (Streissler,1994), the innovation finance connection is at the centre of the capitalist dynamic. Unwillingness on the part of banks and the capital market to fund innovation pushes enterprise into established businesses able to deploy internal finance and so biases the process against the "new man". While, in contrast, the recently instituted innovations associated with the growth of venture capital and corporate venturing, in the USA in particular, is a Schumpeterian response to the highly uncertain nature of business experimentation in the context of radically new technologies and markets (Freeman, 2005).

The social and instituted framing of capitalism matters in another dimension too, particularly in relation to the acceptance or not of the large rewards that can be associated with successful innovation. Inequality of outcomes is integral to the evolutionary process, success and failure are inevitably conjoined and there is no requirement, *pace* the standards of Paretian welfare theory, for those who gain to compensate those who lose. Creative capitalism is uncomfortable capitalism and competition "red in tooth and claw" could rightly be dismissed as unacceptable by many². Exactly similar issues arise not in relation to profits but to the intrinsic instability of economic arrangements in innovation driven systems, the source of much of the disruption that the system imposes on particular individuals in terms of loss of employment, enforced change of locality or loss of capital. Here there is a paradox that Schumpeter forces us to confront: the stability of the price system so important in economic theory must be set in the context of the instability posed by innovation³. Capitalism is a system in which all positions are potentially open to the challenge of creative destruction and will remain so in the present rules of the game. We are straying here into the ethical foundations of capitalism and of how a balance is to be struck between the beneficial effects of creation and the detrimental effects of destruction. It is not that Schumpeter offered solutions to such problems but rather that he knew that an evolving cultural, social

² From a modern viewpoint two instituted responses have been invoked, high rates of progressive taxation to equalise for fully ex post outcomes but this threatens the very link between enterprise and profitability. The alternative is a welfare state safety net that buffers the vicissitudes of innovation driven competition on individuals and localities without undermining the *primum mobile* of the system.

³ It is no accident that the famous paper (Schumpeter 1928) which must have brought his ideas to the attention of most English speaking audiences is called "The Instability of Capitalism" and that it plays on the distinction between institutional durability in the round and the transience of particular arrangements in the small.

component would determine the continuing possibilities for innovation led competition⁴. On average the system is progressive but progress comes at a cost in terms of the unevenness of rewards generated by a restless capitalism. Why is capitalism restless? It is because it has metaphorically struck a Faustian bargain with knowledge as we shall explore below. It is the identification of this connection between enterprise and new knowledge which is Schumpeter's enduring contribution to economics. Like Marshall and Hayek he was well ahead of his time and economic theory has yet to fully absorb the implications of this conjunction of ideas. Indeed if progress, that is to say development and growth, involve the "putting productive resources to uses *hitherto untried in practice*, and withdrawing them from the uses they have served so far" (Schumpeter, 1928, p.378, emphasis in original) this would present three major challenges to a theory of equilibrium economic states, viz: the impossibility of predicting its evolution *ex ante* even when the general rules of its functioning are understood; the irreversible effects of the growth of knowledge and the impossibility of placing an economy in equilibrium if knowledge is not in equilibrium; and, finally, the inevitable link between individuality and personal knowledge such that individuals matter vitally to the evolution of the system. Economic agents are not homogeneous automata and if they were no progress would be possible and no history would await their discovery. It will not be lost on the reader that heterogeneity is a founding concept in evolutionary theory too. It is these three themes that surprisingly connect Schumpeter with Marshall and Hayek. As we shall claim in the conclusion they also connect his thought with modern complexity thinking but that claim must be held in check for the moment.

Marshall⁵

Although Marshall's great work preceded Schumpeter's 1912 opus by fully two decades it is quite remarkable how much they have in common when describing a dynamics of capitalism based on evolutionary principles. Unfortunately, Marshall's evolutionism was not taken seriously by his followers who systematically replaced his dynamics of capitalism by a static jigsaw puzzle in which the economic problem is to explain the most appropriate place of each resource in the economic structure (Shove, 1930). All the talk of biology as economic Mecca was soon forgotten and, worse, commentators such as Samuelson (1967) were able to berate

⁴ Schumpeter, 1943, is the place where his fears that the internal questioning of the system would destroy it from within are expressed.

⁵ The following is something of a footnote to the comprehensive treatment by Raffaelli, 2003.

poor Marshall for his “prattle about the biological method” and the deleterious affects this had had on the development of economic theory. With the benefit of a resurgent evolutionary economics post Nelson and Winter (1982) this dismissal of Marshall is no longer tenable. Marshall’s evolutionary credentials should not be in doubt. As Schumpeter (1941) argues, in his semi-centennial celebration of the Principles, Marshall’s is “one of the first economists to realise that economics is an evolutionary science”, his thought “ran in terms of evolutionary change- in terms of an organic, irreversible process”. That Marshall’s evolutionary credentials are no longer recognised is no doubt in part due to Marshall himself (Loasby, 1990) but it does not require much effort to draw them out and place them in perspective.

What is the evolutionary content of Marshall’s thought? In a remarkable way it runs parallel to Schumpeter, although quite more formal in terms of its use of the demand and supply apparatus. Just as Schumpeter used the stationary circular flow to describe what capitalism was not, Marshall rejects the stationary state as a starting point for economic reasoning. It is a chimera and it is so because it abstracts from the particular processual nature of the economic system. Thus competition in Marshall is not a state of affairs but a process and what matters is that its instituted frame keeps the process open⁶. It is not perfect competition at all but a matter of rivalry, (racing is his alternative description) a contest between competitors of different and changing abilities, grounded in the fundamental characteristics of modern industrial life – self reliance, deliberation and an awareness of the possible future consequences of actions. Competition is not a dull, equilibrium state but rather a creative force promoting spontaneity of action, it is a matter, as he put it, of *Economic Freedom* (1920, I, 1, 10) that is to say, the freedom to use knowledge and capability for economic advantage.⁷ Nor is the idea of competition to be confused with the perfection of the market, which is greatly influenced by the prevailing transport and communications technologies, improvements of which have sharpened the forces that establish common prices for common goods and services. Marshall realised that evolution is not random change but rather a process that presupposes an economic structure a regular order that can evolve. This is why the demand and supply economics of partial equilibrium play such a central role in his analysis, they describe the order and form the substrate on which evolutionary forces can operate. The fact that different forces work with different velocities, is not the basis for a

⁶ Here Marshall is demonstrating that his roots lie in Adam Smith. See Richardson (1975) for a compelling account of Smith’s dynamic theory of competition.

⁷ For further discussion the reader is referred to Groeneweg (2003)

description of different kinds of equilibria but rather a device to account for the connection between structural change and historical time. This is one of Marshall's great contributions to economics, for when different components of the system change at different velocities this necessarily revises restructures the prevailing order, and the prevailing order is all we ever have.

The focus of the *Principles* is the long period when time allows the forces of investment and of innovation in established channels drawing on established principles to work their affects, only in the secular period does Marshall allow radically new, substantive inventions to enter the order.⁸ Let us focus first on the investment side, the process by which firms expand and contract their capacity to supply for this is at the core of Marshall's evolutionary dynamic. In a famous passage Marshall, claims that the tendency to variation is the chief source of progress (1920, V, 4, p. 355). This telling phrase captures in a single step the deep evolutionary content of Marshall's thought but "What is meant by this?" The rest of the *Principles* make clear that variation and progress are connected by a variation cum selection dynamic, Marshall's principle of substitution in which more profitable firms prosper at the expense of weaker brethren. Outcomes are tested in the market so that "society substitutes one undertaker for another who is less efficient in proportion to his charges" (1920, V, 3, p.341). Indeed, in introducing a discussion of profit in relation to business ability, Marshall is quite explicit that this principle of substitution is a "special and limited application of the law of "the survival of the fittest" (1920, VI, 7, p. 597). Furthermore, innovation is inseparable from the competitive process. For the advantages of economic freedom "are never more strikingly manifest than when a business man endowed with genius is trying experiments, at his own risk, to see whether some new method or combination of old methods, will be more efficient than the old" (1920, V, 8, p. 406). The relation runs two ways and mutually reinforces the links between free competition and business experimentation.

This is Marshall's theory of the competitive process in which differentiated business traits, including those in relation to innovation, are connected to differential profitability and thus access to resources from the capital market. Yet Marshall's Darwinian credentials are

⁸ Although this distinction is central to the modern theory of innovation (radical vs. incremental, capability enhancing, capability destroying etc.) Schumpeter took a dim view of the attempt to cut up a homogeneous phenomenon. See Schumpeter 1928, p.378, fn.

sophisticated, there is no necessary implication that the most profitable in terms of time and place is necessarily the best considered from a wider perspective. This is the dynamic significance of external effects, selection is via the price mechanism and the price mechanism does not extend to everything that is of value, especially innovations as yet unborn. The further development of this broad idea is carried out in terms of two devices, the prevailing market order as governed by a demand curve and a particular expenses curve and the concept of the representative firm-Marshall's Achilles heel.

The prevailing competitive order in a perfect market, Marshall's base case as it were, is expressed in terms of a market clearing price but at this price firms with different technical, organisational and managerial traits coexist. The marginal firm just breaks even, any higher cost firms are non-viable and any lower cost firms make superior profits which they can deploy to invest in capacity or innovation. That the market order generates a distribution of profitability in any competitive trade and a correlation between profits and business traits is the foundation for the system's evolutionary performance. Marshall's theory of industry is of course a dynamic theory, it entails entry and exit and the rise and fall of individual firms both relatively and absolutely it is a theory of the restructuring of order not only of the order itself. In this framework the representative firm infamously plays a central role, it is the fulcrum around which other firms rise and fall and in relation to which entry decisions are made. It has been much maligned and much misunderstood. On the question of misunderstanding modern evolutionary theory comes to the rescue. Variation cum selection processes are expressible in terms of the so-called replicator dynamic, in which the changing relative importance of entities (firms in Marshall's case) is governed by how their traits are distributed around the population average vector of traits. Variation and correlation combine to drive the differential growth of the firms in a way conditioned by the prices set in product and factor markets. The theoretical significance of the representative firm is not that it is some real entity but rather a statistical construct, an analytical device around which evolution occurs. Moreover, it too must evolve as the structure of the industry evolves even when the traits of the population of firms are frozen, no wonder it gave rise to such misunderstanding⁹. All of the above is rigorously demonstrable, though Marshall's intuition lacked the means to reason mathematically about the significance of economic variety. On the question of

⁹ The central theorems of modern evolutionary economics relate this theme to the work of eminent biologists particularly R.A. Fisher and George Price. See Andersen (1994) and Metcalfe (1998, 2007) for relevant discussion. Replicator dynamics is standard fare in evolutionary game theory too, Gintis (2002) is an excellent starting point.

interpretation Marshall enjoyed a bad press and not only from his critics outside of Cambridge. Thus when Shove (1930) restates Marshall's economics as a resource allocation jigsaw puzzle organised by arbitrage principles at the margin, it is not surprising that average behaviours have no place. It was left to Robbins (1928) to apply the *coup de grace* and from there no recovery was possible. In their own terms Marshall's critics were right, the average firm is of no more significance than the average machine or the average degree of morality. Unfortunately they had lost sight of the fact that their theory was not Marshall's theory. Marshall talked evolution they talked equilibrium. This is perhaps why Marshall together with Schumpeter and Hayek find no place in mainstream economics, it is not their economics.

Let us turn now to Marshall and the growth of knowledge, for inventions play a significant role in the Principles and so do inventors: although the former may take extended periods of time to develop to their full (Marshall's gradualism at work) while the latter may be recompensed in far smaller degree than the true worth of their inventions would merit¹⁰. Thus Marshall has more to say on invention than Schumpeter and correspondingly less to say about the entrepreneur (the focus of Schumpeter's saltationism). But this does not lead to a conclusion that Marshall ignores the entrepreneurial function, quite the contrary it is subsumed into his theory of management on which he has a great deal to say. Managerial services fall within two broad categories of action: first, the ability to appoint and lead a team of subordinates and to make the most of their abilities while preserving order and unity in the plan of the business; and, secondly, to "know the trade". By this short phrase, Marshall means activities that are closely tied to enterprise and innovation, and included in this category are the ability to forecast market demand, (expectations, as always, play an important role in Marshall's assessment of how people act, and different individuals hold substantively different expectations¹¹), the facility to judge risks boldly but with care, and, finally, the capacity to innovate through the perception of opportunities to supply new commodities or improve methods of production. It is important here to recognise the fact that Marshall, like Schumpeter, had a keen understanding of the German economic tradition which from the 19th century onward had given due attention to innovation and enterprise (Streissler, 1990, 1994). Thus it is to Roscher that Marshall is referring when he claims that a

¹⁰ Those that pioneer new paths may confer on society benefits that are disproportionate to their personal gains even if they "have died millionaires" (1920, VI, 7, p. 598).

¹¹ See Loasby (1990) for further elaboration. We note in passing that a business does not expect to make profits, or losses for that matter, by having the same expectations as rivals. At a minimum, rational expectations in relation to business prospects must mean variform expectations.

characteristic task of the modern manufacturer is to create new wants where none previously existed¹² (1920, IV, 11, p. 280)¹³.. It cannot be said that Marshall did not have innovation and enterprise very firmly in his grasp when he wrote about the distinctive contribution of management to economic organisation. Indeed, Marshall sums up his position in the following terms that serve to intertwine innovation and investment:

“On whichever side we look, we find that the progress and diffusion of knowledge are constantly leading to the adoption of new processes and new machinery which economises human effort on condition that some of the effort is spent a good while before the attainment of the ultimate ends to which it is directed.” (1920, p.286)

The development of these ideas within the Principles is found in three contexts. The first is in the nature of the firm expressed in terms of differences in business traits. In broad terms business leaders are divided into those who open up new and improved business methods and, as in Schumpeter, those who follow beaten tracks (1920, VI, 7, p. 597).¹⁴ In relation to business traits very few employers combine the requisite, multifarious managerial abilities to a high degree and scarcely any two owe their business success to the same combination of advantages. Consequently each business is an ‘individual’, differing in some degree from its rivals, for no two persons pursuing the same aims follow exactly the same route. While evolution in the market is one part of Marshall the other part is evolution of organisation, the firm is not given. There is first the simple consequence of a natural life span for the owner-founder and the need to hand the business on to successors who, if they are family members, are unlikely as a general rule to have the business ability of the founder, despite any advantages of training in business that they might have enjoyed. In Marshall, business dynasties are short lived, and age and experience are intertwined with energy and purpose in offsetting ways through time. This is the theme of the ‘trees in the forest’ and of the rise and

¹² Roscher’s maxim to ‘create new wants by showing people something which they have never thought of having before; but which they want as soon as the notion is suggested to them’ (1920, IV, 11, p 280).

¹³ Compare Gideon (1948), when writing of Pullman and Ford “stirring the dormant fancies of the public until they grew into demands” (p.457)

¹⁴ Not that leadership in innovation necessarily brings a full reward to the innovator, those that pioneer new paths may confer on society benefits that are disproportionate to their personal gains even if they “have died millionaires” (1920, VI, 7, p. 598).

fall of individual firms¹⁵ Variation and development are thus the two central characteristics of Marshall's theory of the firm. Secondly, the ability of the firm to innovate is related to size but size alone is not the whole story. While the large firm has advantages in experimentation due to the resources at its command, the small firm is not denied the chance to innovate, it simply requires exceptional effort and skill and perseverance to do so. Moreover, the diffusion of scientific and technical ideas in trade and scientific literature are an important type of external economy that facilitates innovation by smaller firms. Of course, as many scholars including Schumpeter pointed out this is very much the economics of mid-Victorian Britain. Yet Marshall was acutely aware that the innovation of limited liability permitted the growth of large joint stock companies managed and lead by teams and capable of avoiding the debilitating effects of age. He worried over this but perhaps unduly. Size alone is no protection from economic non-viability and it is not at all obvious that large firms are any less subject to the rigours of selection than are small firms, once the later are established. Rather the large firm has shown itself very capable of mutation; we should not confuse the continuity of a legal entity with the continuity of an economic entity.

The final strand of Marshall's thought which needs attention lies in the role of the wider instituted frame in shaping the evolution of the system. The education system is of vital importance in this regard but it is Marshall's exposition of an innovation systems perspective which marks him out as an economist who understood the interplay between the evolution of knowledge and the evolution of economic activity. Scattered across Principles and Industry and Trade is an account of the innovation process that is thoroughly modern in outlook. As with the treatment of management the organic perception of the division of labour holds sway but now in relation to the generation of new knowledge, and with regard to the internal and external organisation of the firm. Given this outlook it is not surprising to find Marshall claiming that the advances in the sciences of chemical, electrical and biological sciences will open up the prospect of increasing returns to effort for many generations to come. Knowledge for Marshall develops cumulatively in paradigm fashion in chains of related sequences of discoveries, "... each new knowledge being the offspring of others that went before, and the parent of many that follow" (1919, II, 2, p.206). Moreover, knowledge production has to be organised in such a way that '*imagination* creates movement; *caution*

¹⁵ There is some ambiguity here. On the one hand, rising and falling refers to the changing relative positions of firms in a market, on the other hand it refers to the different states of ability and leadership in the life of the firm and the implications for its cost structure.

checks reason by working out parallel but independent chains of thought, and each general rule is *confirmed or discredited* by experiments or observations of specific facts' (1919, II, 2, p. 203, my emphasis). This is not too far removed in broad outline from a variation-selection view of the growth of knowledge that an evolutionary epistemologist might hold.¹⁶

When we turn to the determinants of the innovation process it is no longer sufficient to focus on the firm in isolation, its external organisation in relation to the growth of knowledge matters. So it is not an overstatement to see Marshall as propounding an innovation systems perspective which, of course, is simply another angle on the division of labour and its coordination. But in order to benefit from external economies the firm needs an external organisation, external economies do not come for free and access to them has to be organised and co-ordinated. In Marshall the firm's internal knowledge generating processes are embedded in a broader matrix of national and sectoral arrangements of two broad kinds, the industrial district and the national system of research. The first is well known, the co location of firms facilitates the communication of information, thus it correlates knowledge so that "the mysteries of the trade become no mysteries" and ideas are readily interchanged and, crucially, become "the source of further new ideas", a perfect Marshallian combination of restless knowledge and restless activity (1920, V, 10, p.271). The second knowledge generating structure is not so well known perhaps because it is only found in Industry and Trade (1919). It is articulated in terms of a tripartite ecology of research laboratories: those of the first order, charged with extending knowledge in the large and normally the province of publicly funded universities, the primary originators of scientific advances that revolutionise the methods of industry; those of the second order, charged with generating knowledge directed at the requirements of a particular branch of industry and either organised by single giant businesses or in collaborative association between businesses¹⁷; and those of the third order, quality control laboratories for particular establishments that check that their output meets the standards required. As with any division of labour its functioning depends on how it is interconnected, not in this case by markets but by personal scientific contact and reference to the published literature. The technical research laboratory of an industry benefits from keeping in touch with the chief scientific laboratories, and "the later may gain much and lose nothing" by keeping in touch with the industries whose methods may be improved by the

¹⁶ Vincenti (1990), for example.

¹⁷ Marshall, who was generally enthusiastic about co operative arrangements notes that it may be advisable for such a co operative research venture to be partly funded by the public in order to exercise a degree of control and prevent the emergence of cartels (II, I, 5, p. 101).

fruits of fundamental research. Thus Marshall's account of the innovation processes is one in which advances in knowledge are made by different men, of different capabilities and specialisms, with different motives and different methods. What Marshall doesn't say is how their different objectives and modes of functioning, funding and organisation, may encourage or inhibit the coordination process. Other than to suggest a growing commonality of interest between science and industry at the borderland between science and technique, perhaps aided by public support, the problem which occupies modern Governments is not further addressed.

Having given this attention to knowledge generation in Marshall some brief space must be devoted to his discussion of education in so far as it underpins the expression of individuality which is the mainspring of progress in Marshall. Education serves an important social purpose, to enhance vertical mobility and prevent that "wasteful negligence which allows genius that happens to be born of lowly parentage to expend itself in lowly work (1920, IV, 6, p. 212). It also serves to supply the skills needed for an industrial society in which machinery displaces lowly skilled activities. While a liberal education adapts the mind to use its best faculties in business a technical education develops the skills to master the details of particular trades. National differences are evident to Marshall. The German system is better fitted for developing middle ranks of industry and better fitted to imparting scientific training. But in a passage that is manifestly Schumpeterian in spirit he claims that the English system is better for developing daring energy and restless enterprise (1920, IV, 6, pp.209). That innovation may rest in education is Marshall's point, and the economic value of one genius, Bessemer, Pasteur, Jenner or Darwin, Shakespeare or Beethoven, can repay the cost of their education many times over.

It is somewhat of a surprise to find that Schumpeter never fully accepted the Marshallian vision or rather as he put it the Smith-Mill-Marshall theory of growth (1947b, p7) a conclusion that he had reached much earlier. The 1928 article gives a perfectly fair account of Marshall's theory, the interdependence there contained between investment in capacity and the development of new wants, an endogenous expansion of the system in which the interplay between saving and investment as shaped by the distribution of increasing returns and coordination of activities. Schumpeter's objection is clear, expansion cannot explain expansion, a self exciting system needs a stimulus and that stimulus comes from the new combinations. This is surely correct but it is not accurate as a criticism of Marshall, innovation and invention are part of Marshall's scheme too.

Hayek

Hayek provides us with a very different perspective on the evolutionary nature of economic action. His thought is far more abstract, none of the detailed historical understanding of economic arrangements that mark Schumpeter and Marshall is allowed to surface. There are no specific tools of analysis, Schumpeter's instrumental test of good economic work. Yet Hayek deals with the very foundations of the evolutionary approach in particular in relation to the distributed nature of social knowledge and the consequent restless nature of capitalism. His thought is complex but it is also profound and the best starting point is contained in the essays of 1945 and 1946 for they are the bridge between his previous work on "narrow" economic issues and the broad concern with the instituted foundations of an open society that were to follow. It is not the stationary state which is of concern but rather the closely related description of competition as a state of affairs shaped by given and uniformly distributed data. The 1946 essay opens with a challenge: to compete is a verb and verbs are action words yet in competitive equilibrium there is no action, "How can this be so?" The answer is that competition is a process, more than that it is a discovery process in which different consumers discover which of several possible suppliers will best provide for their needs and conversely. The totality of relevant economic knowledge required to allocate resources in the round is not only known to no one it does not even exist independently of the economic process. Knowledge is not a given datum but the output of the competitive process¹⁸. This is Hayek's key insight, that knowledge is individual, distributed and restless. The 1945 essay completes this picture by explaining the role of the price mechanism in distributing the information required to co ordinate individual action when those actions relate to individuals whose beliefs and knowing are entirely different. When individual knowledge changes, a change that may be unbeknown to any other person, the prices adapt to the new pattern of knowing and change the distribution of incentives or future action. But there is more too the price mechanism than this suggests. Individual, differentiated action underpins individual, differentiated profit just as it does in the evolutionary schemes of Schumpeter and Marshall, as the following passage makes clear:

¹⁸ This leads to some very Schumpeterian conclusions, as when Hayek suggests that a sequence of temporary monopolies, each displaced through a superior innovation, may be economically superior to a state of perfect competition (1948, p.102)

“how easy it is for an inefficient manager to dissipate the differentials on which profitability rests and that it is possible, with the same technical facilities, to produce with a great variety of costs are among the commonplaces of business experience which do not seem to be equally familiar in the study of the economist”, (1948 (1945) p.82.)

Hayek’s economy evolves because its members hold differential knowledge it is an adaptive system that is a marvel but is not a product of human design¹⁹. But it is not only an adaptive system, it is a creative system, and this is the point, its instituted frame generates economic rewards for further differentiation of knowledge. This is the thread that links our three economic giants, it is why stationary capitalism is a contradiction in terms.

Although Hayek never expresses it in these terms the system operates by variation and selection for actions and variation and selection of knowledge. The entrepreneur is not privileged but it is clear that scientific knowledge is only a part of the relevant totality of knowledge required for economic action. It is the individual knowledge concerning specifics of time and place, not general knowledge alone, but rather knowledge that permits the allocation of resources to improve. Schumpeter’s humble knowledge (but not humble entrepreneurs). As he puts it, much of this is transient knowledge, knowledge of “the fleeting moment” not destined to reside in any text book or echo in any university class room.

If individual action reflects a division of labour then it necessarily reflects a division of knowledge and this is the most significant form of variation with which the economist has to contend. Hayek devoted most of his subsequent efforts to elaborating this theme and its evolutionary credentials rest on three themes that recur in The Constitution of Liberty (1960) and the three volumes of Law Legislation and Liberty (1973, 1976&1979). The first is the incompleteness of personal knowledge and the impossibility of a global economic rationality, the foundation of the argument against constructivist rationality and central planning. Hayek’s individuals are not fools, they calculate advantages as best they can but their calculations are local not Olympian²⁰. Since mistakes are common, since the expectations of

¹⁹ Hayek never puts it thus but he means that “the tape is never played twice” a theme that links the history of economies with the history of the natural world.

²⁰ It is an argument that anticipates the Carnegie School and the case for bounded rationality or, better put, bounded cognition and bounded mental capacity. That Hayek could write a major work in psychology, The Sensory Order (1952) is not irrelevant here.

different individuals cannot be satisfied simultaneously and since many (most?) innovations fail the economic system is not only a trial and error process but a learning process for revising knowledge. Incompleteness of knowledge leads to transience, creative destruction in the epistemic realm.

Hayek's second theme relates to the importance of order. Economic action requires organisation and the purpose of organisation is to co ordinate individual efforts to a larger purpose. An evolutionary system presupposes a structure to evolve and in Hayek's scheme this order is provided by a distinction between purposely made and spontaneously arising or emergent order. Not all the features of the economic world arise through conscious design indeed many are the result of competition between alternative, incompatible designs. Order is not only structure it is also stability in the large. Just as Schumpeter saw the importance of an enduring frame of institutions, so Hayek points to the importance of tradition. Only conservative systems can change in an orderly way one of the central paradoxes of the capitalist system it can only change from within because its structure generates conjectures of how it might be changed, instability in the small again. All progress presupposes tradition but tradition is not immutable, it too evolves through variation and selection with the potential value of new rules and practices only ascertainable in relation to existing rules and practices. This is the nature of spontaneous evolution and its consequences are unevenly distributed over time and place. It is the necessary unevenness of knowledge driven progress that unites Hayek with Marshall and Schumpeter and demarcates their account of economic development from anything connected to the idea of a regularly expanding, proportionally growing economy.

The third and final theme relates to the ethical evaluation of the system. Since the progress of knowledge is necessarily uneven it follows that the distribution of economic rewards is also uneven. Property rights are not rights to a certain income flow, returns are as much a matter of chance as they are of skill and they reflect the very diversity of individual purpose in the economy. There is no common objective around which a concept of distributive justice could be formulated, indeed, injustice will be felt even when no one acts unjustly. To say that restless capitalism is progressive capitalism is not to give a normative judgement because in Marshallian fashion the development of knowledge means development of the human material, beliefs and values also change. Rather progress means that fewer errors are made and more valuable problems are solved. Thus Hayek's spontaneous order is like an ever

replenished stream, channelled by the institutional rules of the game which themselves meander more slowly across the cultural landscape, neither economy nor cultural frame can be meaningfully be described in equilibrium terms because their foundations in human knowing cannot be so described.

Consequences: Knowledge and Evolution

Schumpeter, Marshall and Hayek are very different economists, it is not usual to speak of them in the same context, yet it is clear from the above that they are united by a concern to understand the evolution of the economic system. This is the binding thread that has been broken, and its breaking has served to separate them from the canon of mainstream economics. With very few exceptions, their works now rest among the apocrypha of economic thought. In seeking out what they have in common it is not the evolutionary structure of their thought alone that matters, it is its very foundations. What is it that, in their thinking, makes the economic process evolutionary? What is it that separates their thought from the mainstream canon? Three answers can be given as a preliminary response, identifying three strands of that broken thread. We express them in terms of the nature of knowledge based activity; in terms of the institutions of an open, creative economic system; and, in terms of the non-equilibrium nature of economic order. Let us take each one in turn.

The Centrality of Knowledge

The first strand, perhaps the most compelling strand, that binds our three authors, is the idea that the economy evolves because knowledge evolves, the co-evolutionary hypothesis that intertwines the variation and development in the epistemic realm with variation and development in the realm of human action. On this view capitalism is a very particular kind of economic system one that has evolved an instituted structure of abstract and more concrete rules that generates a logical order to economic affairs, a structure that has a remarkable if unintended consequence, it is a system for the self transformation of the prevailing order. This is their most penetrating insight, order is necessary for distributed economic activity to be possible but every capitalist order contains within itself the forces of development. Randomly ordered systems do not develop they drift; it is only structured orders flowing from a logic of organisation that can develop in a coherent, directed fashion. This duality between self organisation and the spontaneous ordering of events on the one hand and the self

transformation of that order through innovation in multiple realms, not narrowly economic, is the principle insight that leads us to capitalism as an evolving system governed by rules of variation, selection and on-going development. Most fundamentally of all capitalism cannot in its very nature be a stationary system for to be so would be to deny the nature of the human material on which economy and society are based. To say that capitalism is knowledge based is mere word play, for it could not be otherwise, but it is a very particular kind of knowledge based system based upon the articulation of distributed knowledge and by accident so designed to facilitate the growth of knowledge. It is as if a Faustian bargain has been struck by our ancestors. Wealth is generated without apparent limit but at the price of a radical uncertainty and indeterminacy in that the future of the system is entirely unpredictable. Is this as Popper suggests the price we pay for being curious humans. Pre capitalism lacked this connection and then a stationary state was a logical possibility, something capitalism could never be without ceasing to be capitalism. Berlin captures the essential point: writing of Vico and his understanding of history we are told, “man is a self transforming creature, the satisfaction of each set of needs alters his character and breeds new needs and forms of life” he cannot therefore live his life “according to unvarying, timeless principles, for then there would be no growth, no historical change, only eternal repetition as in the lives of animals” (Berlin, 2000, p.65). Is this what Marshall had in mind when he warned his readers of the limits of the stationary state?

“But nothing of this is true in the world in which we live. Here every economic force is continually changing its action under the influence of other forces which are acting around it ... Further, all these mutual influences take time to work themselves out, and, as a rule, no two influences move at equal pace” (1920, V, 5, p. 366)

It would take far too long to explore all the ramifications of this position in relation to our triumvirate, only some limited remarks are possible. Economic action is purposeful and belief dependent, whether organised by teams or individuals, and for beliefs to be reliable they must be grounded in the knowledge of the circumstances of economic action, knowledge of many different kinds not just that related to science, technology and productive opportunity. The multiple kinds of knowledge are reflected in a division of labour within and between organised activities in which individuals possess specialised but limited knowledge. To make compatible the actions of idiosyncratically knowing humans is the primary purpose

of instituted co-ordinating rules: of which those in relation to purposefully designed, locally bounded organisations such as firms lie at one end, and the spontaneous, emergent, unplanned order of market relations lie at the other end of a broad spectrum. This is standard stuff from a Hayekian perspective. Designed and evolved orders provide the local and the general rules of conduct to enable each to benefit from the specialised knowledge of the other. As a knowledge system, capitalism has always reflected a balance between two broad ordering principles, those that lead to the correlation of understanding necessary if social action is to be feasible, and those resulting in the de-correlation of understanding and the development of the system. The successive making and re-making of patterns in the minds of individuals carries over to the creation and destruction of economic order. These are the basic principles that underpin order and transformation and make them inseparable. Order is solution to a set of problems but the solution of problems necessarily adds to knowledge somewhere in the system so changing the data on which any general or specific order is based. The system is auto catalytic, “self-exciting” in Frank Knight’s felicitous phrase, the solution of any problem serves only to change the nature of the problem and those problems connected to it in logic or action²¹. While scarcity is rightly identified as a central, perhaps the central, economic problem but it is not only just a problem of order it is necessarily a problem of transformation. That problems of scarcity promotes mental effort and invoke solutions ad infinitum is the lesson of history: yet it is because scarcity is an insoluble problem that it is the basis of dynamics not the basis of statics. Here a little disquisition on the relation between knowledge and information will help.

The position I adopt here is foundationalist, only individuals can know, there is no knowledge without the knowing person. Yet individuals live in “society” and individual knowledge is shaped, refined and continually molded by the activities that individuals engage in during their lifetime and by the contexts that frame these activities. What we know arises and develops partly in the context of our innate curiosity as human beings, and partly via the stimuli provided by everyday experience of interaction with others.

When Adam Smith drew attention to the individually idiosyncratic, specialised nature of personal knowledge, the corollary is that not only the use of knowledge but the development of knowledge is embedded in a social process that is coordinated through appropriate patterns

²¹ See Knight 1935 (1997), p. 170.

of social interaction. The problem here is clear, if knowledge remains private it can inform private action but not social action. For social action to be possible, for actions to be mutually supporting and collaborative even when motivated by very different intentions it is necessary that private knowledge becomes public, shared understanding to the requisite degree. This might happen through individual efforts (mark the famous conundrum that with probability one a troupe of monkeys could exactly replicate Shakespeare's works, given long enough) but in fact it is social structures that vastly accelerate this correlating process by communicating representations of knowledge in the form of information. The transmission of private knowledge into shared understanding is a socially distributed process and this process depends on institutions for the sharing and common interpretation of flows of information. The intriguing point here is that the same economic problem solving incentives that lead to revolutions in energy use and machinery also stimulated developments in the technology of communicating, storing and manipulating information. This record of innovation reflects the fact that information is valuable and the development of information technology from the book to the internet has created a profound shift in the knowledge based nature of modern capitalism. The spread of information separately from face to face, verbal communication is one consequence, the copying of information without error is a second, and the non cultural transmission of information between generations is a third²².

Yet this technological view, from Gutenberg to Gates, leaves the account incomplete. Equally crucial has been the invention and adoption of standards or norms to distinguish reliable from less reliable knowledge. The process of establishing error, of identifying mistakes, is absolutely essential to the growth of understanding. Criteria for falsification and rejection have provided the critical edge that combats the problem of superfecundity, the problem of being unable to distinguish which of the too numerous rival sets of information is reliable and fit for purpose. In regard to science, we enquire of the truth of the relation between conjecture and natural phenomenon. In regard to technology, we enquire whether the device works in the environment in which it is intended such as to achieve the desired effect. In regard to business, we ask does the plan achieve the profitability required to justify its continuation. In regard to social practices we ask if they are acceptable to the relevant community. Without these instituted and thus shared winnowing processes it is not at all

²² The many ramifications of this theme lie beyond my present purpose but are fundamental to the nature of restless capitalism. That printing involved multiple innovation, far more than the press- inks, paper, the dependence on phonetic, script is one theme, that the printed book had a profound effect on individualism is another. On the later see McLuhan 1962, p.158 *et seq.*

clear how knowledge and understanding can grow. Thus the development of private knowledge and shared understanding reflect multiple, instituted processes of trial and error of variation and selection. In this regard we would agree with Campbell (1960) when he argues that all growth of knowledge is predicated upon a process of blind variation and subsequent selection. It should be noted that blind does not mean random rather it means that the validity of new conjectures can never be known in advance since those tests of validity always lie in the future when the relevant knowledge has emerged and been tested.

What of the decorrelation of knowledge? That information is not knowledge but rather a stimulant to knowledge is the central source of the development of knowledge and activity. Modern societies devote significant resources to the process of correlating understanding through education and of reinforcing these correlations through ideas of law, justice and acceptable rules of behaviour. Out of this process comes understanding in common, correlated knowledge, of which the processes that generate science are typical examples. However, a world in which every individual knows the same as any other individual would be a world of stationary knowledge. Indeed, it would be a world in which individuality could not be given any substantive meaning. Knowledge grows because it is individually grounded, because individuals react differently to the same information and transmit the new thoughts to others in a continuous process of communication and challenge. What the paradigm breaking scientist and the radical entrepreneur have in common is that they share a common information flux with others but reach quite different conjectures about the nature of their respective worlds. Information flux leads to change of knowledge and thus to change of information flux perhaps the most powerful example of a positive feedback, irreversible process that we can identify in the course of modern history. Thus the connection between knowledge and evolution is not only a matter of coordination and agreement but of disagreement and dissent, the themes of Schumpeter and Marshall. The instituted rules of modern capitalism are devices of provoking dissent from the established order and ways of channelling that dissent for productive purposes. It is not simply variation of existing knowledge that is the striking feature but variation in the origination of new knowledge and this is the theme of enterprise and innovation not only in the economy but in all fields, science included.

In this regard, the characteristic aspect of the Schumpeter's entrepreneur and Marshall's manager is to de-correlate private knowledge, to sow doubt where previously there was understanding in common. Hence, the emphasis on novelty, on challenging existing practices and understandings that is also typical of the Kuhnian notion of the paradigm-breaking scientist. Thus, entrepreneurs have a dual role. They claim to know differently from others and they challenge the correlated understanding that others possess. The successful among them generate new patterns of understanding in the use of resources, pattern changes that underpin economic growth. It is on this distinction that an understanding of the entrepreneur rests, as the individual who dares to act on the basis thoughts not held by others, who challenges through imagination not calculation alone, the basis of their economic and social co-operation.

That the entrepreneur is the locus of experimentation in the generation of new knowledge also helps explain the restless nature of modern capitalism. Economies can never be at rest because knowledge is never at rest and the prevailing pattern of understanding is always being subjected to challenge. By acting entrepreneurially, an individual generates new information that may lead others to see the world differently in a distributed process of knowledge growth. What is distinctive about modern society is its institutionalization of this process of repeated challenge to existing patterns of knowledge correlation (Gibbons *et al*, 1994). The disruption of the existing economic order is instituted into modern capitalism in a fundamental way. Not only do markets act as the context in which knowledge and conjecture lead to new opportunities for enterprise, the establishment of procedures for generating new knowledge independently of the market context has proved a fertile development in the institutions of modern capitalism. That this creates a problem of connecting the two spheres of knowledge generation should not disguise the remarkable nature of this division of labour. The growth of science and technology in university style organisations or the research laboratories of corporations further enshrines the restless nature of capitalism by devoting a portion of its resources for finding reasons why the world is not as it seems. Adam Smith recognised this at the outset when he claimed that the principles of the division of labour apply not only to the content of knowledge but to the form of the production of knowledge. No wonder the system is restless or that enterprise is the distinguishing feature of modern capitalism.

Thus the evolutionary properties of modern capitalism rest on the particular dynamics of knowledge generation across distributed individuals, many of whom work within the current order but sufficient of whom challenge that order and stimulate the further growth of knowledge. The instituted frame that makes this possible is capitalism's most important attribute; it involves subtle interplay between mutual adjustment to what is known and the disruptive development of that knowledge.

Institutional Design

Economists and other social thinkers have for long understood the link between institutions and the working of the economic system. However, it is remarkable that far less attention is devoted to the idea that the institutions which promote order and coordination also facilitate the transformation of the system through innovation and the development of knowledge. Self organisation seems ineluctably to produce self transformation. A balance is thereby struck between the existing and the emergent so that the system is an open system for generating economic progress, although no normative connotation should be attached to that word without careful qualification. Property rights and their enforcement through law are a familiar example of the link between abstract rules and a regular ordering of economic and social action. That property might be vested in corporate forms of ownership, that ideas might acquire the status of property are commonplace examples of this theme. Strong property rights defined over the ownership and disposal of assets of any kind are essential to exchange based economic system but these provide no guarantee at all of the economic value of the assets in question. As Hayek insisted, what is protected is the expectation of command not the expectation of economic value (1976, Vol. 2, pp. 123-125.). Indeed protection of the later would only be possible in a world of stationary beliefs yet the market process renders that impossible, for it is not the permanence of property rights that matters but their transient market valuations²³.

²³ No better example of this can be found than the rights attached to a patent for invention. These are rights to exploit in a monopoly fashion but in no way do they prescribe the flow of returns that ensues. Indeed the fact that the principles of the patent (its information content) must be placed in the public domain as a condition of its granting is precisely an invitation for other inventors to find alternative routes to the same effect and thus an incentive to destroy the value of the original patent. Patents are an extremely clever institution, their protection is important but it is not unlimited, and deliberately so, and it is helpless in the face of other genuinely novel entrepreneurial actions.

What, then, are the instituted features of modern capitalism that create such a strong symbiosis between knowledge and activity? Property rights apart they are four in number. The first is the open market in which every established business position is open to competitive challenge, unless temporally protected via a patent, copyright or other legal limitation. Entrepreneurship is pervasive because the idea of an open competitive market process is pervasive. Under the rules of restless capitalism a firm never quite knows where the threats to its existence will come from; and frequently they come from such unanticipated directions that their significance is often discounted until it is too late²⁴.

Secondly, markets play fundamental roles in relation to the identification of opportunities for enterprise. Enterprise does not occur in a vacuum it is shaped and channeled by the existing order. This is wrongly put if stated in terms of the 'price mechanism' for prices alone are insufficient statistics, the structure of quantities and qualities are needed as well if the prospective entrepreneur is to gauge the potential profitability of a new venture. Hence, market signals matter not only in the sense of encouraging the efficient use of existing business knowledge, the traditional argument in favour of the competitive organization of industry, but also in the deeper sense of guiding the competitive process of entrepreneurial change. Efficient markets, those that establish uniform prices for goods and services with identical characteristics, are consequently of great importance to the conduct of enterprise for they indicate the real opportunity costs of innovation. Without them enterprise risks misdirection, which is why getting the prices right is a necessary but not sufficient condition for maximizing the developmental opportunities in any economy. All entrepreneurial conjectures compete with and are designed to compete with some existing activity even if the true margins of competition are initially misconceived and revealed in surprising ways ex post. Notice that this remains true even for those radical entrepreneurial conjectures that, for example, introduce products previously unheard of. Even these products must be conjectured to displace existing products in consumers expenditure and to utilise resources employable elsewhere in the economy. We might also add that markets are also instituted devices for generating low cost access to consumers and productive services. Markets are not only structures for indicating the terms on which resources and customers are available they are the channel to gain access.

²⁴ The managerial literature is full of examples of incumbent firms that failed to spot the competitive of innovation by unanticipated rivals. See Utterback (1994) for recent discussion of this disruptive aspect of competition.

This takes us to the final aspect of the institutions of a market economy, the incentives they provide to challenge the prevailing order. Whether or not profits are the *primum mobile* of enterprise, there can be no doubt that profit is a necessary feature of such activity and that the prospect is essential in the process of attracting risk capital to support conjectures for which there cannot be any basis in fact. Novelty of thought may be its own reward but novelty is also the signal that what the entrepreneur does is potentially superior to already established competing activities. Abnormal profits, far from being an index of the absence of competition, are the very proof that competition is actively pursued, that resources are being reallocated. This is the crucial role that profits and losses play in the mobilization of new economic structures, by focusing on a static competitive equilibrium state we hide this from view. Moreover, one of the key institutions of capitalism, the distinction between contractual returns and residual returns, could have no purpose if the system always and everywhere stood in competitive equilibrium. It is because the system is never in equilibrium that the distinction has real force and points to profit not as the consequence of monopoly power but profit as the consequence of differential, enterprising behaviour. This brings us to the final strand, the troublesome notion of equilibrium.

Order vs. Equilibrium

This is the most challenging of issues, even Marshall and Schumpeter make frequent use of equilibrium language, despite their constructing systems of thought to emphasise the non equilibrium nature of economic activity. Equilibrium is, of course, the most frequently deployed concept in modern economics but it is a misnomer. What is called equilibrium is rather a solution to a puzzle created in the mind of the investigator; it is a set of consistency conditions no more no less. Unfortunately, real economic actors do not solve puzzles they deal with problems that in their solution create new information and stimulate new thoughts to reveal new opportunities. It is this mapping between puzzles and problems that is at the root of the difficulty.

If some system is in equilibrium it has reached a balancing state from which no escape is possible without the intervention of external forces, forces that of necessity cannot be part of the specification of the system. Yet capitalism is continuously changing from within, the theme that is Schumpeter's most enduring insight and it changes from within because problem solving stimulates the growth of knowledge. The solution of one problem simply

reveals new problems somewhere in the system in a continuous process of stimulus and adaptive response. I doubt if any business person thinks of their field of influence in terms of equilibrium without risking the very future of their business. However, equilibrium is not order, all evolutionary change presupposes a substrate of order on which the processes of variation, adaptation and development can operate, the system is restless but it is not chaotic. This might be thought a small point if it were not for the fact that it is precisely the equilibrium perspective that the triumvirate react against. Consider three implications of this for the way economic puzzles are constructed. When a modern economist invokes the representative agent what is meant is not some statistic forced on the investigator by a need to accommodate to variety but rather a uniform, perfectly homogeneous agent, conceived as if the concept of individuality was a non essentialist diversion. No evolutionary economist could make such a step without rendering the basis for his theory incoherent and Marshall, Schumpeter and Hayek do not make this false step, they reason in the presence of human individuality, human difference and it is the differences that lead to change. In a world of uniform agents how quite are we to introduce innovation?

Secondly, consider the dichotomy between a state of equilibrium and the dynamics of adjustment to that equilibrium, a standard piece of puzzle solving. Apart from the fact that the logic defining the state of rest is separate from the logic of out of equilibrium adjustment, and could not be otherwise without destroying the description of the state of rest, this device can only be considered viable if the process of adjustment fails to generate information to change the beliefs of the agents on both sides of the market. In real world problem solving one can conjecture that this is never the case. Indeed Isaiah Berlin puts his finger on the inconsistency with complete accuracy, an equilibrium is a Utopia, a fiction, a solution to a puzzle, a state of perfection in which “all is still and immutable and eternal” (Berlin, 1991, p. 22). Not quite an accurate rendering of the capitalist process.

Concluding Remarks

Human kind are not mere calculators, adjusting rationally to circumstances beyond their control but sentient and imaginative designers of alternative worlds, in art, music no less than in science and the economy. Schumpeter, Marshall and Hayek understood this, and how could they not having lived through immense internally generated transformations of Western society and economy. To accommodate this perspective certainly does not mean abandoning

economics, the principles on which order is established are the first task of the investigator and the differences between flexible and fixed prices, perfect and imperfect markets, product vs. process led competition remain as germane as ever. No evolutionist can start other than from an understanding of the rules of order and their consequences. But that is the beginning not the end of the investigator's task. The focus shifts to how the order is self transforming not only self organising, how the instituted frame stimulates and responds to the possibilities latent in new knowledge. This is the necessary step, the intertwining of dynamic principle, institutional analysis and the historical record, if we are to understand the working of capitalism, how it differs from other instituted economic forms and why it produces such uneven development? It is perhaps telling that the growth of complexity science, of which Hayek was deeply aware, may provide the tools and puzzle solving practices to link emergent innovation with economic growth and development²⁵. We should not forget that there is no perfect way of knowing. Perhaps, it is not too late to spin afresh the broken thread perhaps even rescue our triumvirate from the company of the apocrypha.

²⁵ For important developments on this theme see Foster (1993) and Dopfer *et al* (2004).

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