Branching Economic Evolution and Creative Destruction

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Abstract: Schumpeter designed his theory of creative destruction as an alternative to the Smith-Mill-Marshall theory of growth through branching economic evolution. But the two theories are actually complementary. While the theory of the branching of intrafirm and interfirm activities focuses on the gradual evolution of an increasing diversity in economic system, the theory of creative destruction focuses on the dramatic change of any given economic structure. The synthesis of the two theories helps us to understand the possibilities and limits to the gradualism and automatism of evolutionary processes. This paper suggests a synthesis that is based on the idea that the many activities within firms and households are the replicators of economic evolution. Thereby it develops the concepts of creative destruction at three levels: micro, meso and macro.

Keywords: division of labour; branching economic evolution; production activities; replicator; interactor; creative destruction; micro, meso and macro; Marshall; Schumpeter

Introduction

Stan Metcalfe (e.g. 2009) has emphasised that there are crucial common elements in the evolutionary theories of Alfred Marshall and Joseph Schumpeter. He has demonstrated many of these common elements by translating abstract versions of their respective theories into formal evolutionary dynamics (e.g. Metcalfe, 1998; 2007a). He has also suggested that the remaining and obvious differences between Marshall and Schumpeter make their theories complements rather than substitutes (Metcalfe, 2007b). Although much of this complementarity is revealed by the already produced formal reconstructions, we still lack the full recognition of the fact that Schumpeter designed his theory of creative destruction as an alternative to Marshall's classical theory of growth – especially as an alternative to the idea of the gradually increasing division of labour and the related evolutionary process, which can be called branching economic evolution. While the Marshallian theory of the branching of intrafirm and interfirm activities focuses on the gradual evolution of an increasing diversity in economic system, the theory of creative destruction focuses on the dramatic change of any given economic structure. The purpose of the present paper is to demonstrate that these two approaches complements each other's interpretation of the evolutionary process and that they, to some extent, can be synthesised. The present paper suggests that one important type of synthesis can be based on the idea that the many activities within interacting firms and households are the replicators of economic evolution. It is the analysis of the branching of these activities that allows a Marshall-inspired interpretation of aspects of the Schumpeterian concept of creative destruction at three levels of the evolutionary process: the micro level, the meso level and the macro level. This analysis also helps us to understand the possibilities and limits to the gradualism and automatism of evolutionary processes.

Marshall and Schumpeter: substitutes or complements?

In principle the scientific goals of Marshall and Schumpeter were identical: they both thought that the Mecca of the economist is the analysis of economic evolution. Thus Schumpeter (1997, 93) in his "Semi-centennial Appraisal of Marshall's *Principles*" emphasised that "Marshall was one of the first economists to realize that economics is an evolutionary science". Schumpeter (p. 101) also emphasised that Marshall provided "a theory of evolution, an important development of Adam Smith's suggestions, and greatly superior to what Ricardo and Mill had to offer on the subject." However, Schumpeter (1989, 238) was not satisfied with "the Smith-Mill-Marshall theory" in which the gradual division of labour and the related "induced innovations" lead the economy to grow automatically and continuously "like a tree". Instead his evolutionary vision suggested the development of an alternative theory that emphasised the innovative projects of individual entrepreneurs and that reflected creative destruction as the "essential fact about capitalism" (Schumpeter, 1942, 83). Here economic evolution cannot be represented adequately by a process "similar to the gradual organic growth of a tree" (Schumpeter, 1934, 216). Economic evolution is better depicted by the replacement by radically new branches of the older branches of the tree of economic activities.

It is clear that Schumpeter emphasised theory substitution rather than the complementarity of theories. He implicitly suggested that all classical and neoclassical theories of economic evolution (with the exception of that of Marx) represent a vision that can be characterised by the Marshallian motto *natura non facit saltum*, that is, nature does not make jumps. Here new economic activities tend to emerge gradually out of old ones. The basic mechanism is that of the division of

labour, that is, the branching process through which single economic activities repeatedly becomes subdivided. This branching starts by splitting activities within firms but it is further developed when the branched activities are distributed across different firms. It is the intrafirm and interfirm branching of activities that promotes induced innovations, increases knowledge, and promotes smooth economic growth. Schumpeter could hardly deny this phenomenon of branching economic evolution, but he considered it relatively unimportant when compared with the long-term economic evolution through creative destruction. The motto of his alternative theory is *natura facit saltum* because economic evolution is characterised by important jumps. Therefore, he focussed on the competitive process through which new routines repeatedly destroy old routines as well as the related old social positions. He also emphasised that evolution through creative destruction produces major socio-economic losses and conflicts.

We can obtain an understanding of the concrete complementarity between the very different theories of the British economists and Schumpeter by means of history, methodology, and in terms of modelling. The historical approach leads us to recognise that the two theories reflect different historical experiences. To put it crudely, we are facing tales of two cities: Manchester and Vienna. When Adam Smith published his *Wealth of Nations*, Manchester was about to take off as the first industrial city of the world; and when Marshall produced the different editions of his *Principles of Economics*, Manchester was still the world leader of the cotton industry. In this context it was obvious to ignore many of the problems of creative destruction and instead to focus on the gradual growth and evolution of complex industrial systems through the increasing division of labour within and between firms. In contrast, Schumpeter had a broader view of the world economy in which the British

performance was connected to the creative destruction of economic activities elsewhere in the world. This was clearly seen from the viewpoint of Vienna, the capital city of his native Austria-Hungary. Many industries were threatened from abroad, and the emergence of local industries spelled the death of others. More generally, Schumpeter's application of the long-term perspective made it possible to predict the ultimate creative destruction of any thriving economic structure. Even Marshall (1919) had to confront this problem in his *Industry and Trade*.

The methodological complementarity between Marshall and Schumpeter is due to the fact that some aspects of evolutionary processes can best be studied by means of the Marshallian principle of continuity while others are better understood through the Schumpeterian principle of discontinuity. The process of branching economic evolution within a growing industrial district of the Marshallian type can largely be depicted as a gradual process while much of the story of the railways of the nineteenth century can be depicted as the consequence of the radical jump provided by the Liverpool-Manchester railway. But both principles are obviously useful to depict the long-term evolutionary process. At a deeper level there is a need to apply both the Marshallian principle of determinateness and the Schumpeterian principle of indeterminateness (Andersen, 2009, 307–14). The former principle is obviously useful for handling the induced innovations that are part of the process of branching evolution while the latter becomes important for treating radical innovations as well as the type of minor innovation that consists in new combinations with unpredictable outcomes. More generally, we are facing evolutionary processes that especially in the shorter term have some degree of predictability but whose longer-term trajectories cannot be predicted.

We can also approach the question of the concrete complementarity between Marshall and Schumpeter in terms of challenges for modelling. Marshall de-emphasised creative destruction in order to grasp the continuous process of branching economic evolution, and Schumpeter did just the opposite. The result is that economic structures are much too conservative in Marshall and the classics, where the emergent structural diversity is produced by gradual branching of existing business activities. In contrast, Schumpeter has too little specification of economic structure. This reflects his theory of innovations as radically new combinations of pre-existing resources. Consequently his process of creative destruction (that is, the combined processes of innovation and enforced adaptation) ignores structural continuity by emphasising the dramatic change of any given economic structure. But the result is that Schumpeter (1939) in the historical parts of *Business Cycles* had very little theoretical support for his concrete accounts of actual processes of evolution. Here an explicit treatment of the interaction between radical innovation and branching economic evolution would have increased his analytical powers significantly. This is a major reason why a modern synthesis of the Marshallian and Schumpeterian theories is not only difficult but also very important for improving our understanding of the possibilities and limits of gradualism and inheritance in economic evolution.

The synthesis between branching economic evolution and creative destruction can proceed at three levels. At the micro level we combine Marshall's gradual process with creative destruction within particular industries. At the meso level we study how the interindustrial structures created by branching economic evolution can be creatively destructed in a way that affects whole clusters of industries. Finally, we at the macro level studies aspects of creative destruction that can only be studied at the level of the economic system as a whole. This specification of the three analytical

levels should not bee confused with the very different specification of three levels of evolutionary analysis suggested by Dopfer and Potts (2004; Dopfer, forthcoming). For instance, their “micro level” of the entrepreneurs who carry out innovations could in the present context be interpreted as an analytical nano level that concerns the personal and organizational conditions for innovation and routine behaviour. Furthermore, the specification of this nano level can take its starting point in the classical theory of the process of intrafirm and interfirm division of labour.

Firm-level activities and micro creative destruction

The term creative destruction is highly ambiguous if considered in isolation from the context in which Schumpeter presented it. The literal meaning of the term appears to be that “destruction” is in some sense “creative”. Actually, this was the way Werner Sombart, a leading member of the German Historical School, used it. Sombart, for instance, suggested that from the destructive effects of war a new spirit of creation arises as a response to shortages and other pressures. But for Schumpeter creation was a relatively independent event and not a kind of adaptive response. The entrepreneur’s innovation comes first. This innovation is introduced into the system of economic routines through a competitive process that involves bankruptcies or enforced adaptation. Furthermore, Schumpeter (1942, 104n) used the phrase “the process of creative destruction” rather than “creative destruction” per se to characterise “the essence of capitalism”. Thus he described economic evolution as the combination of innovation and enforced adaptation. In contrast, he considered the automatic and adaptive process of branching economic evolution as relatively unimportant. But he provided little empirical evidence to support this judgement. The present paper follows the strategy of taking the process of branching economic evolution as the

starting point and then to add Schumpeterian creative destruction. This strategy is most easy to follow at the micro level.

The theory of branching economic evolution was originally formulated by Adam Smith in terms of a virtuous circle. On the one hand, increases of the size of the market of a firm or an industry lead to the branching of activities, improved subroutines, increased outsourcing, and lower price. On the other hand, lower price leads to increases of the size of the market. Thus the increased size of the market and the continued branching of activities go hand in hand. This is in a nutshell the classical theory of evolution and growth. It is based on the principles of continuity and heredity. New business activities normally emerge from old activities, first within an old firm and then in a new but related firm. This new firm inherits and improves parts of the pre-existing stock of knowledge. So apparently there is no creative destruction. But this aspect of the process lurks in the details.

It is not easy to make a modern reconstruction of the evolutionary logic of the branching process of Smith, Marshall and other British economists. But the starting point could be the fundamental idea that any evolutionary process depends on replicators, that is, entities of which more or less faithful copies can be made (Metcalfe, 1998). The replicators of classical economic evolution seem to be the specifications of each of the many individual activities within firms (and households). To be replicable, an economic activity first of all needs a specification of its task, its output product. But the replicating activity also needs a more or less complex specification of its production process.

Given these, tacit or formal, specifications of the product and the related process, the activity can be passed on to new members of the group that performs the activity. This replication of the activity can be made by instruction of new group

members, but part of the specification seems to be implicit in the machinery and the design of the workplace. In any case, as soon as a replicator has emerged, incremental innovation simply means the change of its product or process specifications. Of special importance for the classical theory of evolution is innovation through the branching of product or process specifications. Horizontal branching leads from one to two product specifications, with the subsequent modification the related process specifications. Vertical branching leads from one to two process specifications, where the new process produces a subproduct for the modified version of the original process. Both horizontal and vertical branching emphasises the gradualism of economic evolution and the inheritance of knowledge.

The other fundamental concept needed for the reconstruction of the classical theory of evolution is the concept of interactors. Each firm (and each household) is an interactor that uses many replicating activities in its attempt to survive and thrive. In analogy to the biological genome, the totality of these replicators might be called the routinome. This strange term emphasises that, at any point of time, the firm is characterised by a particular combination of replicators and that it is the whole of its routinome that determines the firm's fitness in more or less competitive product markets and input markets. But from an evolutionary viewpoint the main importance of the fitness of a firm is that it influences the fitness of each of the replicators that it contains. To this type of section of the members of a firm’s routinome must be added the selection process that takes place within each of the interacting firms. This selection not only involves the differential growth of in-house activities but also the entry of new activities and the exit of old activities. Entry and exit of activities are partly due to the firm-level branching and outsourcing of old activities.

We can simplify by focusing on an activity with a fixed product specification and analyse the evolution of the productivity of the activity that is due to changed process specifications. This analysis presupposes two censuses of the conditions of the activity within an industry. Thereby we are able to account for the evolution of the aggregate level of some characteristic of the activity by means of information about all the instances of the activity within the industry. For instance, we can explain the evolution of the activity's aggregate productivity over the period between the censuses by decomposing into four different effects:

$$\begin{matrix}\text{Total}\\ \text{evolution}\end{matrix} = \begin{matrix}\text{Entry}\\ \text{effect}\end{matrix} + \begin{matrix}\text{Selection}\\ \text{effect}\end{matrix} + \begin{matrix}\text{Intra-activity}\\ \text{change effect}\end{matrix} + \begin{matrix}\text{Exit}\\ \text{effect}\end{matrix}$$

If we ignore the entry effect and the exit effect we explain the evolution of the activity's productivity by means of two effects. The selection effect is caused by the differential growth of firm-level activities with different productivities while the intra-activity change effect is caused by productivity change within each of the firm-level activities. If we only study these two effects, we are dealing with Price's equation, which often have been used implicitly. Thus Metcalfe (2002, 90) pointed out that "[f]or some years now evolutionary economists have been using the Price equation without realising it." However, the full analysis of creative destruction in the context of branching evolution requires the addition of the entry effect and exit effect. If the entries of firm-level groups engaged in the activity has a higher productivity than the industry average, then this can lead to the exit, or creative destruction, of weaker groups that are engaged in the activity. Furthermore, the selection effect represents a less conspicuous form of creative destruction. Here the stronger activity groups expand their employment while the weaker ones are forced to fire some of the employees. This creative destruction of jobs can to some extent be avoided through the enforced adaptation of weaker groups. But this adaptation can also be described as

the creative destruction of old job specification. Thus creative destruction can be present in three of the terms of the extended Price equation.

The analysis at the level of the activity replicators should be augmented by an analysis at the level of firms with many activities. Here better performing activities can, at least for a while, rescue low-productivity activities provided that the intrafirm selection pressure is weak. This is likely to be the case. Just like any genome of a biological individual have its weak spots, the routinome of any firm is likely to include sub-normal activity specifications. Furthermore, different firms are likely to have collections of activities with different levels of branching and outsourcing. This obviously creates difficulties for interpreting studies by means of the Price equation. The theory of roundaboutness by Schumpeter's Austrian teacher Böhm-Bawerk tried with little success to overcome such problems by creating vertical aggregates of activities and by ignoring their distribution across firms (Andersen, 1996).

The extension of the analysis of micro creative destruction from activities to firms is a crucial task. A major reason is that for many employees there is a radical difference between changing job specification within a firm and leaving that firm. When analysing this problem, we have to recognise that there are two Schumpeterian models of creative destruction. In the Mark I model the new firms introduce innovations and imitations while the old firms are largely unable to adapt. Therefore, we expect a large selection effect. This effect includes the expansion of firms with above-average productivity, but the strongest socio-political responses come from those related to the negatively selected firms. In the Mark II model there may still be new entrants, but the innovative and imitative activities of the continuing large firms dominate. If all innovative activities are transferred from individual entrepreneurs that innovate by creating new firms to oligopolistic firms with permanent in-house

innovation, then we should expect to see that an increasing part of evolutionary change is due to the innovation effect while a decreasing part is due to the selection effect. The reason is that such oligopolistic firms do not wait with their reactions until they are selected away. Instead, they use innovation as a means of keeping up with the average behaviour of the population of firms. Thus what the selection effect obtained in an earlier phase of capitalism will now be obtained through the innovation effect. Since this proposition is not generally obvious, we seriously need empirical studies about the issue. In these studies, we will also have much need of the multi-level version of evolutionary change. The reason is that the Schumpeterian large-scale firms consist of many units, and some of the apparent disappearance of the selection effect may be due to a movement from selection between firms to an increased selection within firms. It is, however, on balance likely that we shall find an increased importance of the innovation effect as a partial substitute for the selection effect. Consequently, socio-political resistance to change should diminish. However, the change that takes place within firms is very visible, and resistance may be organised at this level.

Since Marshall and classical economists would hardly deny the suggested types of micro creative destruction, their theory obviously have common elements with that of Schumpeter. There is nevertheless a difference in terms of emphasis and vision. While Marshall saw a progressive process of evolution, Schumpeter saw a conflict-ridden process of evolutionary change with no simple possibilities of making value judgements. Since it is helpful to apply both these visions, we are already starting to recognise the complementarity between Marshall and Schumpeter.

Branched structures and meso creative destruction

To get an understanding of meso creative destruction it is helpful to start with Marshall's (1949, 222–31) well-known theory of industrial districts. This theory was based in the commonplace observation that many English cities and geographical areas were highly specialised around the production of a small set of goods and that they upheld this specialisation over long time spans. It is possible to apply Price's equation to analyse this phenomenon. To simplify we consider only a single industry of a competitive economy. We assume that this industry can be decomposed into subindustries, one in each industrial district. Thus we have an industry that is structured into districts that consist of firms. If we ignore entry and exit, we obtain the following equation:

$$\begin{matrix}\text{Total}\\ \text{evolution}\end{matrix} = \begin{matrix}\text{Interdistrict}\\ \text{selection effect}\end{matrix} + \begin{matrix}\text{Intradistrict}\\ \text{selection effect}\end{matrix} + \begin{matrix}\text{Intrafirm}\\ \text{change effect}\end{matrix}$$

According to this equation we study evolution of, for instance, the average productivity at the industry level in terms of three effects. First, there is the selection between the districts of the industry. Second, there is the intradistrict selection effect that is due to differences in the selection process in different districts. Third, there is effect of intrafirm change. Let us assume that the national industry initially consists of many industrial districts. Within each industrial district there are an intradistrict selection effect and an intrafirm change effect. As demonstrated above both types of effects represent creative destruction. Any district that is relatively successful in this respect gains a competitive advantage in the national process of interdistrict selection while districts with an initially weak creative destruction are subject to creative destruction at the interdistrict level. In the end there might only be one industrial district in the national industry.

The above analysis has ignored the fact that Marshall's theory of industrial districts is related to the theory of branching economic evolution. A growing district is characterised by an increasing set of activity replicators that are organised in series so that the destruction of a using replicator implies the destruction of the dependent supplying replicators. This seems to be what happened in mature industrial districts. They were based on a branching process that took its starting point in a few core activities. All the other activities were derived from and dependent upon the specialised demand from the primary activities. Because of the limited generalisation of the subactivities most of them ultimately disappeared together with the primary activity.

The branching of production replicators can be depicted crudely as vertical branching (see Figure 1). It starts from of the task of producing any of the consumption goods. The related activity can be split repeatedly into subactivities, subsubactivities, and so on. However, one of the many difficulties is that the product of a subactivity can be generalised to serve as input for several using activities as in the case of general-purpose technologies. Thereby, we get a more or less complex production network rather than a relatively simple production tree. Nevertheless, a binary production tree serves as the simplest possible depiction of a non-linear production structure. The nodes of a binary tree are ordered in levels (according to distances from the root node), and the left descendant of a node is distinguished from the right one. Therefore, any activity and product can be described unambiguously. For instance, Activity 8 in Figure 1 can be described from the root upwards as right, left, left, right (or RLLR). With a string of 10 characters, more than a thousand different nodes can be named. With a string of 20 characters, more than a million different nodes can be named. The binary tree also focuses our attention on the

possible points of branching. For instance, Activity 3 still can add a branch and Activity 6 can add two branches if it becomes sufficiently large.

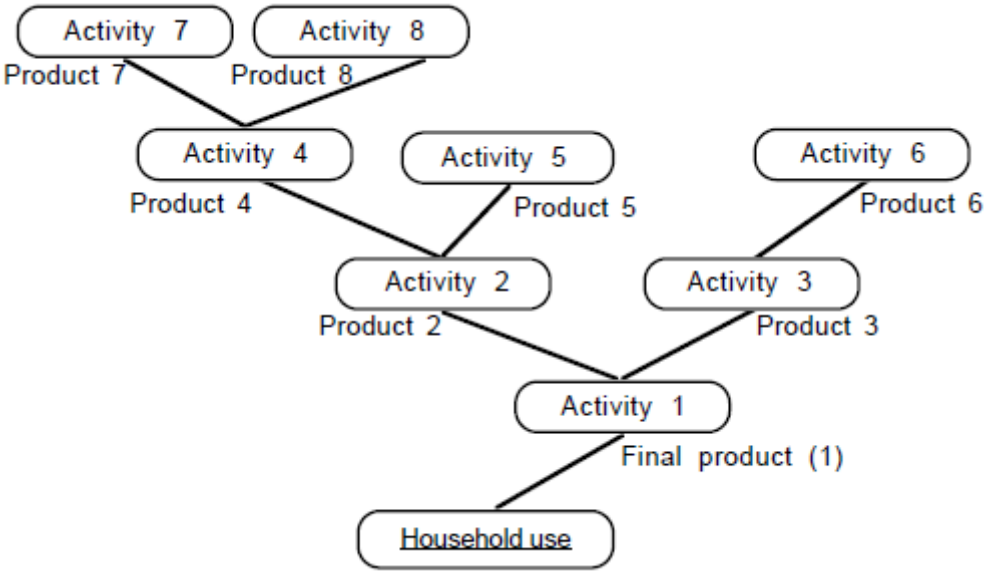

Figure 1: Binary vertical branching of production

Let us now move to the problem of the interactors. Figure 2 depicts three specialisations of firms. But we should remember that, for instance, both specialisation #2 and specialisation #3 were originally performed within the same firm. By comparing the situation before and after this bifurcation, we can consider the benefits and costs of interfirm specialisation.

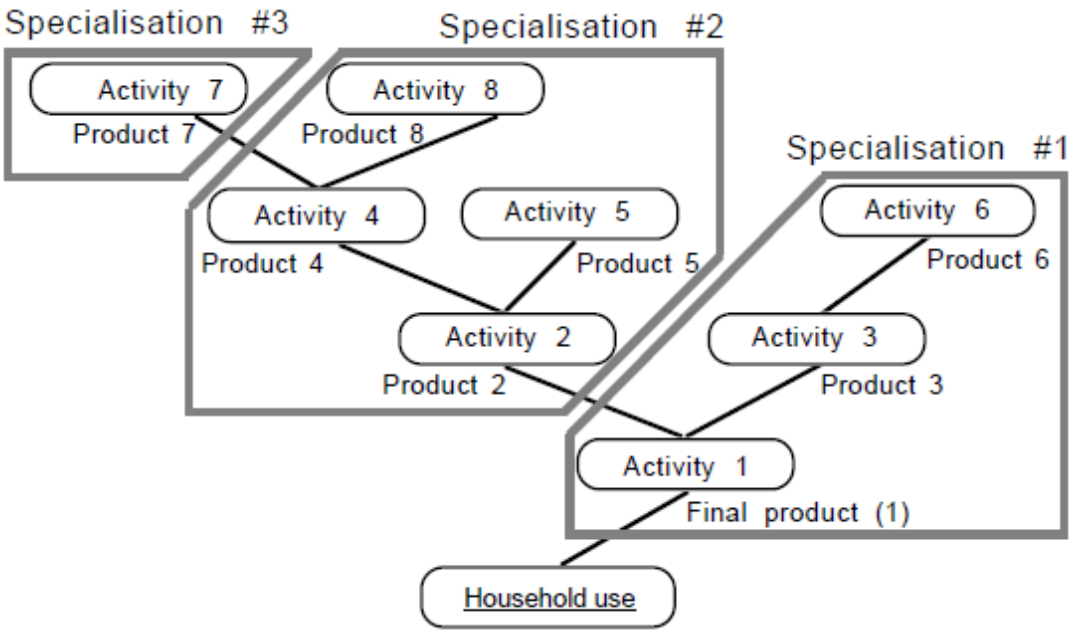

Figure 2: An example of simple interfirm division of labour

An increase of interfirm specialisation means that a firm can concentrate on branching and innovating fewer activities, but "outsourcing" also often means a painful process of creative destruction and reorganisation of in-house activities. An increased interfirm specialisation also has consequences for the overall system of economic activities – as we, for instance, see it in industrial districts. On the one hand, we obtain improved products and processes because increased interfirm specialisation of activities in many ways promotes innovation, learning and productivity. On the other hand, interfirm specialisation increases of transaction costs and several other types of costs. The most important problem is that interfirm transactions not only promote better replication but also worsen the conditions for innovation in the long run. The main reason it that the functioning of complex systems presupposes a replicator structure with increasingly fixed product specifications and this conservatism constrains both product innovation and process innovation. Thus the scene seems to be set for the creative destruction of parts of an economic system like a successful industrial district. It is often unable to cope with the challenge from a

radical innovation that outcompete its fundamental activities. Similar problems can emerge for non-localised industries whose branching process was analysed by Allyn Young (1928).

The branched economy and macro creative destruction

It is at the level of the economy as a whole that the difficulties of synthesising the contributions of Marshall and Schumpeter become most obvious. One of the major reasons is that they represent very different modelling strategies. One the one hand, Marshall applied the type of partial equilibrium analysis that he invented while On the other hand, Schumpeter was struggling to transform the Walrasian general equilibrium framework in a way that made it useful for his evolutionary purposes. He did so by thinking of a macroscopic evolutionary process that is punctuated by periods in which the evolutionary process has come to a halt and some sort of equilibrium state has emerged.

Schumpeter's explanation of the stoppage of macroscopic evolution is that the "capitalist engine" depends on waves of entrepreneurial projects and innovative credit that are punctuated by periods with no evolutionary propulsion. After a period without propulsion the economic system reaches a state in which no important evolutionary change took place. This state of Schumpeterian equilibrium is the idle state of the capitalist engine (see Figure 3). The energy for the propulsive stroke is provided by innovations and their finance. This propulsive stroke brings the engine into a maximally disequilibrated situation. Then the reactive stroke sets in. This reactive stroke brings the engine back to the idle state through creative destruction. The image of the capitalist engine thus serves to draw attention to the basic Schumpeterian framework that can be summarised in the following way: (1) An equilibrated system governed by the adapted routine behaviour of the mass of agents (2) is challenged by

the innovative behaviour of Schumpeterian entrepreneurs, (3) but sooner or later the creative destruction of old routines will establish a new routine system in which the entrepreneurs and their innovations have been absorbed; (4) and then the story starts once more.

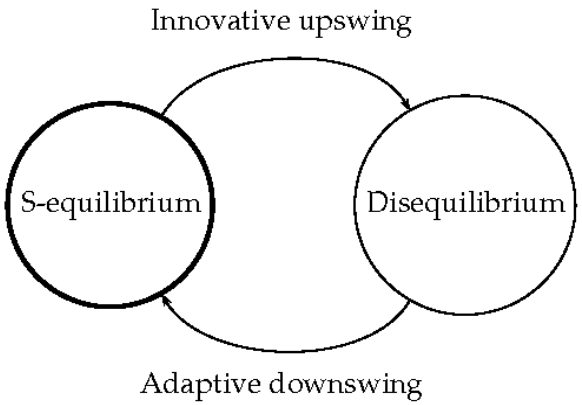

Figure 3: Schumpeter's capitalist engine with a two-stroke cycle

Figure 3's specification of the two-stroke cycle in terms of two mechanisms emphasises that Schumpeter focused on the transformation of the economic system as a whole. This becomes especially clear when we try to use his metaphor of the capitalist engine to characterise the waveform evolution that he thought is underlying business cycles. The propulsive stroke can be identified as an innovative upswing (or "prosperity") and the reactive stroke as the subsequent adaptive downswing (or "recession"). This downswing performs the creative destruction that was made necessary because of the innovations of the upswing. Thus the cycle of the two-stroke engine is completed. However, Schumpeter was interested in the outcome of a whole series of cycles of the capitalist engine. The result of such a series is long-term economic evolution. Thereby the mechanisms of the capitalist engine can be said to have produced a stylised history of the economic system. This history can be depicted as a sequence of Schumpeterian equilibria. These states are qualitatively different and

cannot be satisfactorily compared by any measure of economic growth. Nevertheless, the two evolutionary mechanisms that bring the capitalist engine from one idle state to the next one have characteristics that produce “progress” in a very loose sense. The mechanism of innovation presupposes that entrepreneurial projects have characteristics that in some sense are better than some of the routines of the previous state of Schumpeterian equilibrium. Furthermore, although the mechanism of adaptation can be described as creative destruction it also secures some degree of localised “progress”. However, the sequence of circular flows cannot produce any clear-cut welfare theory in the style of Pareto. It is also highly unlikely that the result of the process of creative destruction will by social consensus be accepted as an unambiguous improvement.

Although Schumpeter rejected the idea that evolution could be stopped by insufficient demand, we probably have to turn to demand-side explanations in order to make an easy synthesis between Schumpeter and Marshall. It is, however, difficult to stop the process of branching economic evolution even by means of demand-side factors. Marshall inherited Adam Smith’s already mentioned theory of the virtuous circle and its expansion into a comprehensive classical theory of evolution and growth. The generalised classical theory depicts a historical process that starts by the outsourcing a few basic household activities to firms, and thereby these activities become incrementally innovated and performed more efficiently. The increased income of households leads not only to increased demand for existing goods but also to the branching of consumption and to new business activities. Furthermore, the increased production leads to the vertical branching of activities within and between firms. This is in a nutshell the classical theory of evolution and growth, which based on the principles of continuity and heredity. It also depends on an idea of a hierarchy

of goods that is gradually exploited as the result of increased income. If we abstain from any detailed theory of household production, the evolution of the demand replicators can be depicted as horizontal branching (see Figure 4). The starting point for the specification of the next demanded good is the specifications of the already demanded goods. Thus the figure depicts a situation in which the production of four household goods has been outsourced to firms while increased income is needed for the outsourcing of product #5. If this product fails to emerge even if there is sufficient demand, the economy might enter a situation with satiation of the demand for the already produced products and stoppage of further intrafirm and interfirm branching of activities. But it is difficult to implement this idea formally (Andersen, 2001).

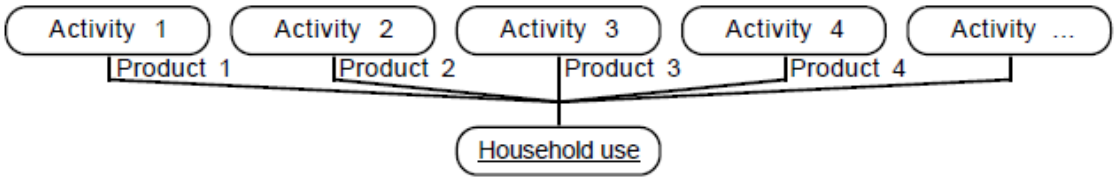

Figure 4: Simple horizontal branching of household demand for final products

Even if it might not be possible to stop the macro process of branching economic evolution, it is easy to include creative destruction in the classical story. We simply have to recognise that some of the new consumer products are substitutes rather than complements of some of the already produced consumer products. If a replacement takes place, then there is a creative destruction of the whole branched production structure that depends on the replaced products. We have already considered this type of creative destruction in relation to the meso-level analysis, but the macroscopic effects can be very widespread. Furthermore, the macroscopic fluctuations of income will lead to waves of creation and destruction of activity replicators. More erratic fluctuations in the level of creative destruction can be caused

the emergence of new techno-economic paradigms (or general-purpose technologies). This emergence leads to the reorganisation or destruction of large sets of replicators within the economic system.

Conclusion

The paper has given some suggestions of how we can produce a modern synthesis between Schumpeter's evolutionary theory and the classical theory of Marshall and other British economists. The core message is that we should start by reconstructing the classical theory of branching economic evolution before adding the theory of creative destruction. The synthesis of the future seems to promise an improvement our understanding of the possibilities and limits of gradualism and inheritance in economic evolution.

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