

‘New Combinations’ in the Economy and in Economics

A Tribute to Stanley Metcalfe*

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Scientific analysis is not merely a logically consistent process that starts with some primitive notions and then adds to the stock in a straight-line-fashion. It is not simply progressive discovery of an objective reality.

Schumpeter (1954: 4)

ABSTRACT

The paper discusses an important case of the production of economic ideas by means of economic ideas: Stan Metcalfe’s view of the restlessness of capitalism was shaped by ideas he had encountered in Schumpeter, and Schumpeter’s view was influenced by ideas he had encountered in Marx. The three authors’ aim can be said to consist in an elaboration of a *histoire raisonnée* (Schumpeter) of capitalism, in which the development of technology and science and its translation into economic analytical terms occupies centre stage.

1 Introduction

When in 1995 we started the *Graz Schumpeter Lectures*, the question was whom to invite as the first lecturer. We had a number of scholars in mind, all of whom represented well the legacy of Joseph Alois Schumpeter. The latter, it ought to be recalled, held a chair at the University of Graz from 1911 to 1922, a period that saw the publication of several of his works, especially *Theorie der wirtschaftlichen Entwicklung* (Schumpeter 1912). Stan Metcalfe’s name was on our short list. I talked to Ian Steedman on the occasion of one of his visits to Graz and he strongly recommended Stan. We followed his advice and invited Stan, who kindly accepted. We never regretted to have chosen him. He gave a set of four excellent

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talks in Graz, just the right thing to start such an ambitious project. And he delivered the final draft of his lectures for publication in good time. His book *Evolutionary Economics and Creative Destruction* (Metcalf 1998) quickly became a classic contribution to evolutionary economics. It is a thorough and deep book, essential reading for the profession.

In the book Stan writes about the origin of his interest in Schumpeter's work:

The *Theory of Economic Development* was the first book I read as a newly graduated research student and it shaped my view of the economic and social world to a degree which it is impossible to overstate. In the final analysis it helped me to find a framework within which to fit the ever present diversity of economic life. Schumpeter also gave me a compelling interest in the study of history in general and the history of technology and science in particular. (Metcalf 1998: xi)¹

In this short tribute to Stan I am interested in the production of economic ideas by means of economic ideas. Stan's view was shaped by ideas he had encountered in Schumpeter, and Schumpeter's view was influenced by ideas he had encountered in Marx, etc. Of course, having been a quick and untiring reader and a connoisseur and collector of good ideas, Schumpeter can be shown to have been influenced by several economists, including, of course, his Austrian peers, especially Friedrich von Wieser. To demonstrate good taste in terms of picking up, elaborating and putting together ideas expressed (or reiterated) by others does not in itself imply a lack of creativity and originality. What matters are 'new combinations' of known ideas, as Schumpeter kept stressing in specifying the nature of economic innovations. In short, while almost each and every idea Schumpeter put forward had its precursors, it is the particular reconfiguration of these ideas and their blending that matters and that defines the specificity and novelty of his contributions. New combinations

¹ I had, I believe, a comparable experience as a student, but the book that kept fascinating me ever since I first tried to read it was Piero Sraffa's *Production of Commodities by Means of Commodities* (Sraffa 1960). Interestingly, Schumpeter was also fascinated by Sraffa's contributions published during his lifetime, i.e. Sraffa's criticism of Alfred Marshall's partial equilibrium theory in the mid 1920s and his debate with Friedrich August von Hayek on the latter's monetary overinvestment theory of the business cycle in the early 1930s. With regard to the former, Schumpeter in the *History of Economic Analysis* spoke of Sraffa's 'brilliantly original performance' (Schumpeter 1954: 1047 n. 54), and with regard to the latter he informed Sraffa in a letter written in Italian that he fully agreed with him. He considered Hayek's idea that business cycles were typically caused by the banking system and not by innovations as taking a collateral effect for a cause.

matter in economics no less than in the economy. They lead to new knowledge and improve our understanding of the generation, diffusion and effects of such new economically useful knowledge.

While Schumpeter singled out Marx as someone who had a deep understanding of the *endogenous* character of innovations in a capitalist economy and therefore of the latter's restlessness, he could have been more detailed as regards the Marxian legacy in his works. Both Marx and Schumpeter were concerned with the 'beat of the heart' of the capitalist economy, as Schumpeter (1939: v) put it, and with its long-run development and eventual destiny. There are striking similarities between their analyses, but also important differences. In this note I shall deal with some of them. Section 2 recalls briefly Schumpeter's general appraisal of Marx's contribution to an understanding of the restlessness of capitalism. The following two sections deal with important differences between Schumpeter's view and the views of the classical economists and Marx. Section 3 turns to their different assessments of the role of individuals, 'entrepreneurs', on the one hand, and systemic conditions, competition, on the other, for the dynamism of an economic system. Next, in Section 4, we counterpose their different views of the cause of profits. Section 5 comments on Schumpeter's concepts of 'new combinations' and 'creative destruction' and traces them back to the writings of Adam Smith and Marx. Section 6 summarizes briefly Marx's studies of technical inventions. Section 7 then turns to the deeper reason for his view that technical change in capitalism involves a rising organic composition of capital, which implies a falling tendency of the maximum rate of profits. Section 8 concludes.

2 Schumpeter on Marx and the 'source of energy within the economic system'

In his endeavour to come to grips with the central feature of the capitalist economy – its endogenous dynamism – Schumpeter singles out Karl Marx as the only important economist who before himself had grasped and analysed this fact (see also Rahim 2009). While this judgement does not do justice to numerous other authors, including, for example, David Hume, Adam Smith, Charles Babbage, John Stuart Mill (see Rostow 1998) and several German economists in the second half of the 19th century, it rightly stresses Marx's pioneering role in analysing the all-encompassing nature of economic, social, political and cultural change involved. 'Economic theory in the traditional sense', meaning inter alia Léon Walras's general equilibrium theory, Schumpeter emphasizes, 'contributes next to nothing' to an explanation of the problem at hand (Schumpeter 1934: 60 n). Only Marx is said to have

dealt with economic development from within the economic system. Schumpeter in fact writes that his own ‘statement of the problem is more nearly parallel to that of Marx. For according to [Marx] there is an *internal* economic development and no mere adaptation of economic life to changing data. But my structure covers only a small part of his ground’ (ibid.). And in the preface to the Japanese edition of his *Theory of Economic Development* he maintains that ‘the idea and aim’ that underlie his book ‘are exactly the same as the idea and aim which underlie the economic teachings of Karl Marx.’ The feature that distinguishes Marx’s and thus also Schumpeter’s analyses from that of other economists is ‘precisely a vision of economic evolution as a distinct process generated by the economic system itself’ (Schumpeter 1951: 160-61). In the said preface Schumpeter also points out the reason for his growing disenchantment with the Walrasian approach. The latter does not allow one ‘to say much about the factors that account for historical change’, because it ignores the fact ‘that there was a *source of energy within the economic system* which would of itself disrupt any equilibrium that may be attained.’ Without a clear grasp of this source of energy one is prevented from understanding ‘the struggles and vicissitudes of the capitalist world’ and explaining ‘a number of phenomena, in particular the business cycle’ (Schumpeter 1951: 159-60; emphasis added).

Yet there are important differences between his approach and that of the classical authors and Marx, some of which are rooted in Schumpeter’s adoption of Léon Walras’s ‘methodological individualism’, a term coined by Schumpeter (1908; see also 1954: 888). To these we now turn. We begin with a discussion of the importance of the entrepreneur, on the one hand, and competition, on the other, for economic development.

3 On the prime mover of economic development

The prime movers of economic development in Schumpeter are entrepreneurs, men possessed of exceptional qualities of leadership and vision, whereas in Marx, largely in accordance with Adam Smith and other classical authors, it is systemic conditions, the ‘coercive law of competition’ (Marx), that forces producers to innovate (or imitate) in order to prevail in the competitive struggle. The motivation behind innovations Marx discusses in the chapter dealing with ‘relative surplus value’ in volume I of *Capital*. He points out that a capitalist who introduces a new and superior method of production can sell the commodities

above their individual, but below their social value ... *This augmentation of surplus-value is pocketed by the capitalist himself Hence, ... there is a motive for each*

individual capitalist to cheapen his commodities by increasing the productiveness of labour. (Marx 1976: 434; emphases added)

‘Each individual capitalist’ therefore has a persistent motive to innovate. For fear of one of the rivals gaining a competitive advantage that endangers his or her existence, to innovate is not something left to the individual capitalist’s discretion, but an existential must, enforced by competition. Modifying a famous dictum of Marx, we might say: ‘Innovate, innovate! This is Moses and the prophets.’ In the classical economists and Marx a systemic characteristic is responsible for the permanent revolution of the types and qualities of goods produced, of the methods of production used and of the way in which firms and markets are organized. The coercive law of competition compels producers incessantly to introduce new methods of production in order to escape their competitors in given markets or to introduce new types or qualities of goods in order to escape them in newly established markets. Competition means rivalry, and only the successful innovator will survive. In this view innovations are not the result of a particular inclination of a group of people characterized by exceptional capabilities, they are rather the result of a behaviour of agents enforced by competitive pressures. Exceptional skills and capabilities are commonly advantageous in the battle of survival, they are not, however, the prime mover of development, but its medium. The impulse comes from the institutional characteristics of the capitalist economy and translates itself into the aspirations and actions of people. In the struggle with their ‘inimical brothers’ (Marx) – their competitors – capitalists are compelled to innovate on penalty of their own ruin.

According to the the classical-Marxian point of view there is some correspondence between the nature or style of an economy (or the ‘mode of production’) and the kind of people that populate it. An economic system tends to generate from within the aspirations, attitudes etc. of agents or rather economic roles congenial to it. Recall David Hume’s idea that different social conditions activate different dispositions in men and Adam Smith’s conviction that the apparent differences among men are to a large extent the result of their socialization, reflecting the social division of labour much more than men’s innate characteristics. While in Schumpeter the sung hero is the individual entrepreneur, who is seen as the demiurge of novelty and development, in the classical economists and Marx it is first and foremost the particular institutions of economic and social life in capitalism – rivalry and competition – and the antagonisms both between and within different economic classes that drive the system.

In Schumpeter's view (1912: 103-5 and 137-8) it is not so much a systemic cause that keeps generating change from within the economic system, it is rather the existence of 'a second type of economic action'. In addition to the genotype of 'hedonic' or 'static' men and women there is the genotype of 'energetic' or 'dynamic' ones, which is much smaller in number and constitutes an 'elite'. The latter genotype is said to be the 'agens' of economic development. If this type did not exist there would be no economic change. To Schumpeter entrepreneurial capabilities are inherited and not learned. Not for nothing he expresses a high opinion of the founder of eugenics, Francis Galton (1954: 791). This view is somewhat contradicted by Schumpeter's conviction that in the course of capitalist development and the bureaucratization of the economic sphere it entails, even the innovative activity will eventually get routinized in large companies. The tension between Schumpeter's Walrasian perspective on the one hand and his evolutionary perspective on the other is well brought to the fore in Simon Kuznets's review article of *Business Cycles* (Schumpeter 1939). Schumpeter's concept of long waves, Kuznets (1940) commented drily, presupposes that heroic entrepreneurs will get tired about every fifty years. Indeed, Schumpeter's concept of entrepreneurs sits somewhat uncomfortably with his otherwise evolutionary perspective on the economic system.

4 On the origin of profits

As regards his explanation of profits, Schumpeter is well aware of the fact that he parts company with essentially all received views, whether 'Austrian', marginalist, Marxian, classical or other. In order to see more clearly the singular position he took, it is useful to recall what the statistician and economic theorist Ladislaus von Bortkiewicz (1906) had stated – a few years prior to the publication of Schumpeter's *Theorie* – in a major German economic journal, *Schmollers Jahrbuch*, which Schumpeter consulted regularly and in which he published several of his papers. Against Böhm-Bawerk's explanation of interest (i.e. profits) in terms of the 'superiority of more roundabout processes of production' Bortkiewicz had insisted that the 'touchstone' of the theory of interest is

whether it is able to show the *general cause of interest* also for the case in which not only *no technical progress*, of whichever type, takes place, but also the length of the periods of production appears to be technically predetermined, so that *no choice is possible between different methods*. (Bortkiewicz 1906: 970-1; emphases added)

Hence, according to Bortkiewicz the 'general cause' of interest had to be identified with respect to a *given* system of production. An explanation of interest in terms of a choice of

technique as in Böhm-Bawerk or in John Bates Clark and other marginalist authors did not meet the criterion. This part of Bortkiewicz's proposition Schumpeter may have met with approval, as can be inferred from his own controversy with Böhm-Bawerk after the latter's frontal assault on Schumpeter's own 'dynamic' theory of interest and profits (Böhm-Bawerk 1913), to which Schumpeter replied with an uncompromising counter-attack (Schumpeter 1913).²

However, it is safe to assume that Schumpeter was much less pleased with Bortkiewicz's related dictum that technical progress must also play no role in an explanation of the cause of interest. For this was precisely what Schumpeter had attempted to establish: profits (and interest) are a fruit of innovations. In a system of production in which the methods of production are known and fixed, there simply can be no profits, was Schumpeter's counter-dictum. This is perhaps one of the reasons why in the *History of Economic Analysis* (1954: 851) he passed a rather unfavourable judgement on Bortkiewicz, calling him a 'comma hunter', who 'had no eye for the wider aspects and deeper meanings of a theoretical model.' More to the point: the two authors had fundamentally different views of what the *touchstone* of an explanation of interest and profits was.

Not only Schumpeter's student and then colleague Paul A. Samuelson found Schumpeter's assessment of Bortkiewicz's contribution unfair and misleading and was very critical of his teacher's explanation of profits (see Samuelson 1943). Here it suffices to stress the distinction between what the classical economists from Adam Smith to David Ricardo called 'normal' or 'ordinary' profits in conditions of free competition and 'extra' or 'surplus profits' that successfully innovating firms are able to pocket. The distinction between normal and extra profits was later adopted by all major marginalist authors despite their otherwise very different theories. Bortkiewicz apparently had the classical distinction at the back of his mind when formulating his dictum. A normal rate of profits emerges in given conditions of production, if real wages do not absorb the entire net product. When and why this is so had to be explained in terms of a theory of wages. The tendency of wages to some historically and socially defined level of subsistence that falls short of overall labour productivity and thus leaves room for a positive rate of profits is explained along different lines by authors such as Smith, Ricardo, Marx and modern advocates of the classical approach to the problem of value and distribution, such as John von Neumann and Piero Sraffa. Yet they can all be said to share some version of the surplus approach to an explanation of profits.

Setting aside the concept of normal profits, Schumpeter is forced to assume that in the circular flow there are neither interest nor profits. Translated into a marginalist framework with a choice of technique in the sense of factors of production that can be substituted for one

² It has been reported that in private conversation Böhm-Bawerk dubbed Schumpeter's explanation of profits one of the 'biggest errors' ever committed in economics.

another as in Samuelson's (1943) discussion of Schumpeter's contribution, this would involve an economic system fully saturated with capital. However, such a situation of capital saturation would need a long time to come about. This would in turn deprive the circular flow of any relevance as one actual, albeit idealised, phase among several others forming a long wave of economic development, in terms of which Schumpeter saw major innovations getting incorporated in the economic system.

The problematic character of this aspect of Schumpeter's conceptual framework can also be illuminated in the following way (see Kurz 2008). A new method of production that pays profits (in the sense of Schumpeter) will be adopted. The profits the innovator gets have the character of a differential rent and express his or her temporary monopoly position. Sooner or later the new method will become dominant in the system via the swift growth of the innovating firm and a swarm of followers imitating it. This involves a change in output proportions, with the commodity in whose production the innovation has taken place and whose cost of production has decreased becoming relatively abundant. As a consequence, its price relative to that of the other commodities can be expected to fall.³ This implies, however, that the profit position of late adopters of the new method will erode: they run the risk of incurring losses and eventually even of being eliminated from the market. With Schumpeter's zero-profits condition in the circular flow, the drama unfolds with exceptional rapidity, because any drop in the product's price immediately implies losses and not only a subnormal rate of profit of the 'static firms'. In the classical authors and Marx the transition from one long-period position to another can be expected to be much more sluggish, because static firms start from positive and not zero profits and are therefore able to survive longer even if they happen to remain inactive. Ricardo for perfectly good reasons, it seems, was very critical of the assumption of 'instantaneous' adjustments of the stock market kind in the real economy. A successful stock jobber and attentive observer in general, he realised that this is not characteristic of industries with large fixed capital investments, nor does it adequately reflect the element of ignorance and irrationality of agents.

³ In classical political economy the adjustment process under consideration is referred to as the 'gravitation' of 'market' prices to their (new) 'natural' levels. In terms of the concept of commodity rates of interest Sraffa (1932) employed in his debate with Hayek about the latter's theory of the business cycle it may be put as follows: the market will typically expect that the supply of the commodity in which an innovation has taken place will increase relative to the supply of the other commodities. Accordingly the forward price will be below the spot price in the case of the former and above it in the case of the latter. This means that the commodity rate on the former will be higher than the rates on the latter. In competitive conditions, this divergence of rates is but another expression of the divergence of actual or market prices from their new long-period levels, which will prompt profit-seeking producers to adjust output levels and thus engender the transition to the new long-period position.

Schumpeterian profits (as the *extra* profits of the classical economists) are a *transitional phenomenon* to be traced back inter alia to cost differentials between different methods of production used simultaneously. These profits are not due to the ‘scarcity’ of capital, as marginal productivity theory maintains, nor due to the ‘exploitation’ of workers, as Marx and socialist authors maintain, but due to the successful perturbation of the economic system in terms of new combinations.

A final remark on Schumpeter’s construction is apposite. Since the diffusion of the new and the replacement of the old is taken to lead from one circular flow to another, all long-term benefits will in the last instance *idealiter* go to the owners of primary factors of production, workers and land owners, whereas (some) capitalists benefit only intermittently. This is Schumpeter’s special version of the classical idea of the unintended consequences of self-seeking human behaviour. Entrepreneurs, concerned only with their own advancement and success, in the end serve a higher cause.⁴ It is a magnificent dynamics reflected in ever improving income levels of the population at large.

5 ‘New combinations’ and ‘creative destruction’

Schumpeter is frequently credited with the invention of new concepts, such as ‘new combinations’ or ‘creative destruction’. The former specifies, in abstract terms, what innovations are seen to consist of (Schumpeter 1934: 66), while the latter directs attention to the fact that new knowledge is frequently the enemy of old knowledge incorporated in skills, tools, machines, work routines, firms and whole industries (Schumpeter 1942: 83). Yet both concepts are much older.

The idea that the parent stem of new particles of knowledge is the bulk of already existing particles that have been preserved and that may be reconfigured and recombined, can be traced far back in intellectual history and is to be found, among others, in the writings of René Descartes and Johann Amos Comenius. Among economists it was Adam Smith who prominently advocated the idea of new combinations in a famous passage in the *Wealth of Nations*. He emphasized that an aspect of an ever deeper social division of labour was the emergence of a separate industry which, in modern terms, is concerned with research, development and innovation: he speaks of ‘philosophers or men of speculation, whose trade it is, not to do anything, but to observe every thing; and who, upon that account, are often

⁴ Schumpeter’s panegyric on entrepreneurs is reminiscent of David Hume’s on ‘merchants’. Both kinds of people are seen as selfish and perhaps even somewhat queer – Schumpeter (1911: 137) refers to ‘half-pathological’ aspects of the behaviour of entrepreneurs – but without knowing and without intending it, they promote a higher end.

capable of *combining together the powers of the most distant and dissimilar objects.*' He added: 'In the progress of society, philosophy or speculation becomes, like every other employment, the principal or sole trade and occupation of a particular class of citizens' (*WN* I.i.9; emphasis added).

While in Smith the idea of new combinations was clearly spelled out, in Marx we encounter even the term. In volume III of *Capital*, published posthumously by Friedrich Engels in 1894, in the context of a discussion of the so-called 'law of the falling tendency of the general rate of profit', he points out that the 'competitive struggle' drives '*every capitalist* to lower the individual value of his total product below its general value by means of new machines, new and improved working methods, *new combinations*', designed to increase the productivity of labour (Marx 1959: 255; emphasis added). *Every capitalist* is bound to do so, because if he fails in this regard or does it badly, innovations by others will lead to a fall in the price of the commodity that cuts into his profits and endangers his existence as a capitalist. Competition involves a struggle for survival. Schumpeter, who was an attentive student of Marx's works, may well have come across the passage and have adopted the term for his own purposes and with his own interpretation.⁵

As to the concept of 'creative destruction', Schumpeter introduces it in his book *Capitalism, Socialism, and Democracy* (1942), but the general idea was already there in some of his earlier writings. In the book he devotes a separate chapter to it. He states:

The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process. It may seem strange that anyone can fail to see so obvious a fact which moreover was long ago emphasized by Karl Marx. Yet the fragmentary analysis which yields the bulk of our propositions about the functioning of modern capitalism persistently neglects it.

He adds that capitalism

⁵ When Max Weber invited Schumpeter to contribute an essay on the history of economic ideas and methods to what may be called a German version of *The New Palgrave*, the *Grundriss der Sozialökonomik*, Schumpeter (1914) based his contribution essentially on two sources: Marx's *Theorien über den Mehrwert* (edited by Karl Kautsky at the beginning of the century) and the first volume of Eugen von Böhm-Bawerk's magnum opus, *Kapital und Kapitalzins*, which was devoted to the history of the subject under consideration. Marx's influence on Schumpeter is perceivable throughout the essay. Following Marx, he calls William Petty the founder of political economy.

is by nature a form or method of economic change and not only never is but never can be stationary. And this evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment which changes and by its change alters the data of economic action. ... *This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in ...* (Schumpeter 1942: 82-3; emphasis added)

This view is foreshadowed in Schumpeter's comparison of his own explanation of the business cycle with Arthur Spiethoff's in the second edition of his *Theorie*, which was then translated into English. There he insists 'that as a rule the new does not grow out of the old but appears alongside of it and *eliminates it competitively*' (Schumpeter 1934: 215; emphasis added).⁶ The 'competitive elimination' of the old by the new, of which Schumpeter speaks, is, of course, reminiscent of the collateral damage caused by the competitive struggle between the inimical brothers, to apply again Marx's notion – capitalists striving for higher profits and using innovation as a major weapon in the competitive struggle (see, for example, Marx 1972, pp. 285-90). Indeed, as Marx emphasized, there is not only a conflict between workers and capitalists about wages and working conditions, there is also a conflict between different capitalists striving for larger market shares and the elimination of their competitors.

Innovations change the economic system incessantly from within. They eventually decide the destiny of capitalism. In Schumpeter (1942), whose ideas in this regard are similar to Rudolf Hilferding's in *Das Finanzkapital* (1910), it is the replacement of free competition by monopolistic and oligopolistic market forms and the building of trusts and cartels that pave the way towards socialism, whereas in Marx it is a falling tendency of the rate of profits. Both authors were keen to understand the role that technical and organizational progress played in this and therefore studied in remarkable detail the history of technology and science.

What can be said about technical change over time? Was there some form prevailing over others, and if yes, which and why? When Schumpeter was still alive, Marx's studies of the history of technology had not yet been published, although bits and pieces had surfaced in his published writings. Since at present no English translation of the studies is available, it is perhaps useful to provide a brief summary account of them (see also Roth 2010). This is done in the following section. In Section 7 we then discuss how they filtered into his economic analysis.

⁶ For a comparison of the analyses of Spiethoff and Schumpeter, see Kurz (2011).

6 Marx's study of advances in technical knowledge

Marx saw technology develop, following an inner logic and giving rise to different phases in capitalist development. He distinguished broadly between three such phases: Co-operation, Division of Labour and Manufacture and Machinery and Modern Industry (Marx 1954: part IV). Similarly Schumpeter, who saw capitalist development as a sequence of 'long waves', or 'Kondratieffs', defined them in terms of what he considered to be the main innovations that spurred them, i.e. the steam engine, railways, electricity and the automobile. Both authors studied advances in technical knowledge, getting down even to engineering minutiae.

From an early time onwards Marx was deeply interested in the development of technology and its interaction with economic and social development. In the period of 1844 to 1847 he took the second edition of Adolphe Blanqui's *Histoire de l'économie politique en Europe* (1842) as a guide to his own studies of political economy. In Blanqui's book Marx came across references to, among others, Charles Babbage's *On the Economy of Machinery and Manufactures* (1835) and Andrew Ure's *The Philosophy of Manufactures* (1835). He took extensive excerpts from them in one of his notebooks dealing with the division of labour, machinery and industry (Marx 1982). At the time, Marx's main concern was with the impact of improved and new machinery on costs of production and prices and on their labour-displacing effects, which was to become a key element in his theory of the 'industrial reserve army' of the unemployed and of the pauperization of some strata of society. He made use of his excerpts in his critique of Pierre-Joseph Proudhon in *La misère de la philosophie* (Marx 1847).

Marx continued his studies of technology after having emigrated to England in 1850. In the library of the British Museum he ploughed through numerous books devoted to political economy, technological change, the mechanical arts, agronomy etc. and copied extensively from them (Marx 1981). He absorbed, at least partly, the available German literature on technology, especially several works by J.H.M. Poppe, Johann Beckmann's five volumes *Beyträge zur Geschichte der Erfindungen* (Beckmann 1780-1805), and a German translation of Ure's *A Dictionary of Arts*. He also read works, for example, by J.F.W. Johnston and Justus von Liebig on agricultural chemistry and geology and the practical usefulness of recent breakthroughs in them. In this period his interest in the technical details of inventions appears to have increased. In parallel he continued to study the factory system and the machinery problem. He read carefully, inter alia, Peter Gaskell's *Artisans and Machinery: Moral and*

Physical Condition of the Manufacturing Population (1836) and John Fielden's pamphlet *Curse of the Factory System* (1836).

A further intensification of his studies of technological change came in the 1860s. Whilst preparing the manuscript of 1861-1863 which was to lead to volume I of *Capital*, he re-read his earlier excerpts and used them. He was particularly interested in technical inventions in the textile and other industries and the role they played in the Industrial Revolution. This question had bothered him already at an earlier time, unconvinced as he was by the received explanations. In his view a proper understanding of the Industrial Revolution necessitated a clear view of the dynamism of machinery-based systems of production, of 'a system of machinery [which] constitutes in itself a huge automaton' (Marx 1954: 360), its revolutionary character and inherent drive. As he was to stress in *Capital*, while in previous systems 'the worker makes use of a tool; in the factory, the machine makes use of him' (Marx 1976: 548). With the subsumption of workers under machinery and the production of machines by means of machines, he was convinced, the capitalist economy entered a new age and became the hotbed whose historical function it was to increase labour productivity 'geometrically'.

Several elements in Marx's analysis of machinery and the factory system point in the direction of what we nowadays call dynamic increasing returns. Such returns Adam Smith had already touched upon in his analysis of the productivity enhancing effects of the division of labour. Marx added several important elements to it. He insisted on the 'accumulated experience' of single workers which increases with cumulated output, but he added that there can be expected to be spillovers to and from society at large. The involved 'learning by doing' (and 'learning by using'), as we call the phenomena under consideration nowadays, is a social process that is endogenous to the production process. And 'since there are always several generations of workers living at one time, and working together at the manufacture of a given article, the technical skill, the tricks of the trade thus acquired, become established, and are accumulated and handed down.' (Marx 1976: 458-9). This is a clear articulation of positive externalities. 'Manufacture', Marx goes on to say, 'produces the skill of the specialized worker by reproducing and systematically driving to an extreme within the workshop the naturally developed differentiation which it found ready to hand in society.' (Ibid.) Modern industry is said to create 'a continuity, a uniformity, an order, and even an intensity of labour, quite different from that found in an independent handicraft or even in simple co-operation' (Marx 1976: 464-5). The technical conditions forced upon workers in manufacturing have a tendency to standardize the labour process and save labour time per unit of output. Its

precondition is a tremendous and continued increase in the amount of constant capital (plant and equipment) employed per worker and especially an increase in the fixed capital intensity of production.

7 Maximum and actual rate of profits

Modern industrial systems, as was pointed out by authors from William Petty and François Quesnay via Adam Smith, David Ricardo and Robert Torrens up to Karl Marx, Friedrich von Wieser, Schumpeter's teacher, and Schumpeter himself, are characterised by a circular flow, i.e. the production of commodities by means of commodities. The mathematical properties of any such system of production (setting aside, for simplicity, land and the rent of land) include a maximum level of the rate of profits, R , associated with a minimum (subsistence) wage rate, and a maximum level of the wage rate, W , associated with a zero rate of profits, and a relationship between the actual rate of profits, r , and the wage rate measured in terms of some standard of value (or, alternatively, the share of wages in the net product), w . A lot of energy of the classical economists and of Marx went into studying these properties, and although they did not fully accomplish the task, they improved substantially our understanding of (decomposable and indecomposable) multi-sector systems of production (see Kurz and Salvadori 1995: chapter 13). Ricardo was the first to put forward the idea of an inverse relationship between the rate of profits and wages. Marx elaborated on Ricardo's argument within the framework of strictly circular conditions of production in his schemes of simple and extended reproduction in volume II of *Capital*. These allowed him, among other things, to specify the constraints to which the economy is subjected regarding the problem of capital accumulation and economic growth.

Marx (like Torrens before him) saw that in circular flow systems the maximum rate of profits was finite, not infinite as with unidirectional processes of production, as they were, for simplicity, occasionally postulated by Ricardo and later by the Austrian economists from Carl Menger to Eugen von Böhm-Bawerk and then, more recently, by John Hicks in his 'Neo-Austrian' approach. Marx with his labour-value based accounting took the inverse of society's overall 'organic composition of capital', which is defined as the ratio of dead labour stored up in constant capital, i.e. the produced means of production, C , and fresh or living labour employed (representing value added), L , as giving the maximum rate of profits of the system:

$$R = \frac{L}{C}.$$

The question then was, what would happen to R as the capitalist economic system develops? Does the ‘law of motion’ of capitalism involve a particular bias of technological change reflected in the movement of R over time? As is well known, Marx was convinced that this was indeed the case: it involves a rise in the organic composition, expressing the particular form technical change takes in capitalism (Marx 1959: 212-3). And he was convinced that the implied fall in R would sooner or later lead to a fall in the actual rate of profits, r , which in turn would express the fact that the capitalist mode of production was not eternal, but like all previous forms temporary. However, his argument lacks cogency and Marx himself appears to have had doubts about it (see Kurz 2010).⁷ Clearly, assuming for the sake of the argument that the long-term trend of the organic composition is rising, the implied fall in the maximum rate of profits does not by itself entail a fall in the actual rate: it all depends on how the rate of surplus value or the share of wages in national income develop together with R .⁸

Schumpeter did not follow the classical economists and Marx in this regard. His assumption that the competitive process will tend to wipe out all profits (and not only extra profits) and land the system after it has absorbed an innovation again in a profitless circular flow implies that if profits were to be considered a constitutive feature of capitalism, then capitalism according to his vision is a recurring temporary phenomenon.

8 Concluding remarks

Like Marx and Schumpeter before him, Stan Metcalfe is an attentive student of the development of contemporary technology and science and spillovers to the economy. Fully in accordance with those two authors he is concerned with identifying the ‘source of energy within the economic system’ that accounts for ongoing historical change. We owe him important insights into the reasons for the restlessness of capitalism and the laws that govern its motion. His Schumpeterian perspective on the economic system is, however, enriched with classical ideas and concepts. As his writings demonstrate impressively, he successfully avoided certain idiosyncracies encountered in Schumpeter, such as the zero profit (and interest) assumption regarding the circular flow. His analysis of the introduction and diffusion

⁷ Recent empirical studies of the shift of the relationship between the rate of profits and wages show, however, that the maximum rate of profits tended to decrease during recent decades; see, among others, Foley and Marquetti (1999).

⁸ During recent decades the share of wages has substantially decreased in many European countries. Even with a moderately falling level of the maximum rate of profits the actual rate will in all probability have risen.

of novelty into the economic system is indeed akin to that of the classicals, which revolves around the concept of ‘extra’ or ‘surplus profits’. Indeed, much of the Schumpeterian story can be told in these terms, having recourse inter alia to the classical idea of the gravitation of prices towards some centre of attraction; see in this regard the recent work by Metcalfe and Steedman (2011). Again, we are confronted with the phenomenon of ‘new combinations’ in economics.

Following in the footsteps of Marx, Schumpeter’s grand goal was to overcome the ‘sea of darkness’ that hides the law of motion of the capitalist economy from our eyes (Schumpeter 1908: 626). This involved ridding himself from the straitjacket of static allocation and equilibrium theory. His invitation to the profession of economists to change perspective alas went largely unheeded. Only a few scholars followed him. Stan Metcalfe is one such laudable exception. Without the insights of economists from Schumpeter to Metcalfe into the principles governing the dynamic behaviour of the economic system, the sea of darkness surrounding us would be thicker – and quite thick it still is, viz. the response of the economics profession to the current worldwide financial and economic turmoil.

Given his magnificent style of writing and explaining, Stan Metcalfe has pleased a growing community of admirers with not only the quality, but also the beauty of the intellectual fare he has to offer.

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