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INNOVATION ECONOMICS AND THE ROLE OF THE INNOVATIVE ENTREPRENEUR IN ECONOMIC THEORY

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Innovation has become a widely used, but ill-defined, everyday term in the 21st century. Firms are urged to be innovative to gain or sustain a 'competitive edge'; consultants advertise their strategic advice as the essence of innovation; the survival of local organisations depends on the capacity building that comes from innovation; schools are exalted to have innovation in their curriculum; and universities promote themselves as leaders in innovation. Likewise, the term entrepreneur, used to describe the human agency behind innovation, is equally ill-defined in everyday use. Entrepreneurs' value to society varies widely from positive to negative depending on the emphasis of journalists, academics, businesspersons, unionists, right-wing think tanks and left-wing activists. Such imprecise definition is, however, undesirable in academic discourse and the focus of this paper is the shifting role of the innovative entrepreneur in economic theory and some of the reasons for this dynamic.

In this paper, innovation economics is defined as a body of economic theory that contends a priori that economic development is the result of appropriated knowledge, innovation and entrepreneurship operating within an institutional environment of systems of innovation. This distinguishes innovation economics from other branches of economics, including mainstream neoclassical theory, which views capital accumulation as the primary driver of economic development, chiefly in the form of economic growth. In the innovation economics paradigm, the socio-economic world functions as an open and complex system, exhibiting tendencies to adaptation. This is
in contrast to neoclassical economics that regards the economy as a closed system exhibiting tendencies to mechanical equilibrium.

A history of economic thought perspective is adopted in this paper to first trace out the rise of the innovative entrepreneur in early theories of political economy, to in effect create a nascent innovation economics. Then, the disappearance of innovation economics is facilitated by the infanticide of the innovative entrepreneur at the hands of neoclassical theory. In the first half of the 20th century, the history of economic thought marked the resurrection of the entrepreneur as an innovating agent by Joseph Schumpeter and then the nurturing of this agent in economic theory by Michał Kalecki. This occurs in terms the role of the innovative entrepreneur in the dynamics of economic theory and its centrality in explanations of business cycles and economic development. In particular, Schumpeter contends that the innovative entrepreneur only makes a stage appearance when discontinuous innovation appears as a supply-side mechanism and then Kalecki explains the realisation of such innovation as a demand-side mechanism.

The innovation systems (IS) approach is the dynamic view of the innovation process that has become recognised through the initial work of Richard Nelson as evolutionary economics, and also through James Kenneth Galbraith in the form of institutional economics. However, the role of the entrepreneur in both these paradigms lacks coherence. This leads to a conclusion arguing that the dynamic, innovation-driven development of the economy is not the domain of, and cannot be explained by, neoclassical economic theory. An alternative approach from heterodox schools of thought is required. Innovation economics is the appropriate stage upon which this approach needs to evolve and advance, but this stage is currently beset by a diversity of explanations for dynamic innovation and the role of the entrepreneur in this process. Greater consistency and coherence about these phenomena is a necessary first step in which the heterodox theories advanced since Schumpeter can progress on a sound ontological basis for an innovation economics in which the role of the innovative entrepreneur is clearly central to the economic processes being studied.

THE ENTREPRENEUR IN POLITICAL ECONOMY: THE RISE OF INNOVATION ECONOMICS

The word ‘entrepreneur’ derives from the French entreprendre, indicating the entrepreneur as literally an ‘undertaker’. Aspromourgos (2012a, pp. 106-7) traces its common usage in French from the 14th century, and its first use in
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Economics by Richard Cantillon in the published French text of his *Essai sur la Nature du Commerce en Général* in 1755. All entrepreneurship textbooks attribute the term to Cantillon (see for example Frederick et al., 2006, p. 28).

The initial (and tentative) appearance of the entrepreneur in economic thought spans from Cantillon’s *Essai* in 1755 to Karl Marx’s *Das Kapital* in 1894, which is also the period considered to be the birth of economics as a discipline. This body of work at the time was known as Political Economy (PE), reflecting economics’ broad political nature as a result of the Industrial Revolution bringing about structural change and consequent massive shifts in income distribution away from the landed aristocracy, while the new industrial capitalists reaped financial rewards on the basis of significant exploitation of the workers.

In this *milieu*, provisioning of income derives from an economic function performed by factors of production. While rent to landowners (for land) and wages to workers (for labour) are distinct; the returns to capital are less precise. The enterprise can be considered to be the source of profit, but what does that entail? Aspromourgos (2012a; 2012b) in two deep textual studies of the early PE writers investigates entrepreneurship as a theoretical concept in their writings. In these studies Aspromourgos identifies possible undesirable attributes of activities or contracts (at least to the agent) can be compensated for by a premium above cost for risk-bearing payment that is a form of capital-provisioning, along with investment in capital plant and equipment. Where in enterprise there is routine management, this can be reduced to labour-provisioning, since managers are merely higher paid employees. What is left as a residual from all this economic function provisioning can be considered as the ‘pure’ surplus that can be attributed to innovation embedded in uncertainty.

Most of the income derived by businesspersons as a result of what they do daily when steering enterprises can be allocated in the economics framework of PE to labour, capital and land provisioning. None of this provisioning has anything to do with being an innovative entrepreneur. So where in the PE literature does innovation in the sense of novelty occur and how is it framed within their PE economics? Aspromourgos (2012a; 2012b) in his two studies answers these questions directly. He shows that Cantillon has only a risk-bearing ‘entrepreneur’ in his *Essai*; while Quesnay and Turgot, as leading Physiocrats, recognise technical change in agriculture (which is technical diffusion favouring large-scale agriculture in an already practised production method) as capital and land provisioning. Aspromourgos attributes the first elements of the economics of innovation in James Steuart’s 1767 *Inquiry* in which there are slight commentaries on a class of agents who are engaged,
“...somewhat, in innovation and in otherwise uncertain or risky or speculative enterprises. Still, to the extent that Steuart was familiar with Cantillon, the slightness of his treatment of undertaking is surprising... [Overall] ...Steuart’s lack of an adequate conception of capitalistic production” (Aspromourgos, 2012b, pp. 13-14) indicates a primitive and deficient innovation economics framework. The evidence in the works of the incomparable classical economist, Adam Smith, shows that he (unlike his PE predecessors) did not ignore entrepreneurship in the strict innovation context, but he did not emphasise the agent of innovation. Aspromourgous (2012b, p. 15, emphasis in original) speculates that this is “...because he was more interested in the consequences of innovation, for economic development.”

Smith wrote in 1776 specifically on innovation as economic development in his book the Wealth of Nations, identifying three improvements out of specialisation that result in dramatic increases in productivity: worker dexterity, time saving and mechanised machine invention. Von Tunzelmann (1995, p. 36) assesses the first two as merely ‘one-off’ improvements that expire quickly due to limits of boredom and being an initial structural shift, respectively. The third factor provides the basis for long-run growth through the accumulation process as new machines bestow the ability for labour to continually specialise. Further, Charles Babbage in On the Economy of Machinery and Manufactures (Babbage, [1932] 1963, p. 21) extends the Smithian innovation exposition to the need for systemic co-ordination through the ‘mental division of labour’. This latter factor is not ‘once-off’, but the type of management of human resources that notoriously produced Fordist hierarchical “scientific management” (Taylor, [1911] 1967) through mass production, but continues today in a more considered form under the human resources management business discipline. Together, the last two factors (one technological, the other human) create the path of economic growth via increasing scale of production. This path provides the first elements of an economics of innovation framework in which the innovative entrepreneur can be clearly detected as the economic agent who introduces under uncertainty these process innovation mechanisms. This framework is clearly set within dynamic economics in which time is crucial as changes create uncertainty, but also a progression (be it negative or positive) occurs bringing about economic change and development.

John Stuart Mill’s Principles of Political Economy in 1848 is regarded as the first economics textbook and, as later editions appeared, was still a textbook used in the 1920s in the United States (Canterbery, 1995, p. 68). Yet, despite Casson’s (1987, p. 151) assertion that this book popularised the term ‘entrepreneur’ in England, Aspromourgos (2012a, p. 18) finds only one use
of the term in all seven editions, and only in French to indicate the lack of an adequate equivalent in English. This is hardly evidence of a strong foundation for the innovative entrepreneur and the innovation economics it needs to spawn.

Starting from the same innovation perspective as Smith, Karl Marx in his three volumes of *Das Kapital* sees the social organisation of work under specialisation in the early years of the Industrial Revolution as a response to the initial mercantilist interest in expanding profit-making opportunities. Yet, as the Industrial Revolution powered on into the 19th century, Marx observes the limits to the scale of specialisation which then induces a capital-goods machine producing sector with inter-industry relations coming into operation. When such machines are validated by capital accumulation, the result is technological innovation. Marx identifies this second stage of the innovation process as “expanded reproduction” that allows capitalism to continually grow. This growth is imperilled by the social relations of production, manifested by conflict over the distribution of income between capitalist and workers. This conflict undermines the profitability of firms and creates instability in capitalism that materialises as business cycles (Marx, [1894] 1959). This Marxist cyclical contradiction in the context of 20th century monopoly capital is explicated in great detail by Michał Kalecki, as discussed later in this paper. Again, this approach emphasises the dynamics of innovation economics.

In the context of reproduction, Marx was the first to identify the entrepreneur in the modern business management theorist conception as ‘first mover advantage’ by which innovative start-up firms introduce an innovation. However, these start-ups will find it very hard to maintain their advantage since they would have “…far greater cost of operating an establishment based on a new invention as compared to later establishments arising ex suis ossibus. This is so very true that the trail-blazers generally go bankrupt, and only those later buy the buildings, machinery, etc. at a cheaper price, make money out of it.” (Marx, [1894] 1959, p. 103)

Although the focus is on process innovation, compared to the modern product innovation story, this is a very cautionary account of the limits to first-mover advantage even with modern-day brand awareness. Further it supports empirical evidence that suggests the first entrepreneurs that take the start-up risk under the high uncertainty of a deep recession have severe susceptibility to failure (Sundbo, 1998). This accounts both for the number of start-up failures on the path to recovery, and the many ‘false starts’ that occur during troughs. Thus, the more innovative the entrepreneur in making significant shifts in technological and organisational structure within
the firm, the greater the susceptibility to failure. The path of innovation economics was opening wide by the end of the PE period, and that path was both critical (in examining the contradictions of innovation) and realist (in understanding the uncertainty of innovation).

THE ENTREPRENEUR IN NEOCLASSICAL ECONOMICS: THE DISAPPEARANCE OF INNOVATION ECONOMICS

After one hundred years of the Industrial Revolution the conflict between land-owners and capital-owners was settled in favour of the latter, and threat of labour-owners demanding more as economies grew rapidly was a battle to be fought and won by the capitalists. This battle was not only on the political stage of parliaments and barricades, but also in the social acceptance of the new industrial system as the economic ‘natural order’. As a result, attention of economists shifted away from understanding economic development arising from the innovation path, and focussed on the resulting allocative efficiency problems that emerged from this paradigm shift to the capitalist economic structure. They tried to explain these problems by analysing the distribution of products (consumer market) and income (resources market) in a comparative static approach. To them innovation was adequately analysed by Smith, and any further adventuring down this PE track would lead to Marxist economics. The obsession with static distribution issues gained its full luminosity in neoclassical economics (NCE) with the rise of the Marginalist Revolution in the mid-19th century.

What happened to the entrepreneur in NCE? She disappeared into what Rosenberg (1982) calls the economists “black box” into which resources go in, and products come out. Inside this box is where the process of innovation occurs. This stems from the NCE obsession with resource allocation through optimising price-guided distribution issues, rather than through entrepreneurial-guided production issues. This is a strange “black box”, given that NCE analyses pricing decisions which have to be made inside this same box (the firm) when the industry is not in perfect competition. Further, there is also the crucial exogenous element of science and technology which flows into the box but is considered as inappropriate for economists to analyse (Robbins, 1932, pp. 32-8), and thus left undetermined. Yet, the production function encapsulates the best-practice technology fix between resources with two ways to advance this technology. One is the ‘unresearched’ parametric shifts in the function, and the other is the unexplained induced innovation from a rise in one factor price.
To neoclassical economics, science and technology are the antecedents of innovation while ignoring the role of human management in innovation (Sanidas, 2005, p. 70). Thus, any broad national or global problem resulting from economic growth (particularly greenhouse gas emissions) is resolved by higher prices (e.g. energy) and the exogenous advances of science. This is the standard NCE approach on the power of human scientific knowledge and its applications to overcome the constraints of nature. In this economic framework, business activity is conducted under what Schumpeter (1939) calls “competitive capitalism”, in which there is no innovative activity and the market is operating as a pure neoclassical mechanism in which the ‘nirvana’ of market efficiency in the allocation of goods and services is achieved. This is a static equilibrium position in which there is no change, no economic development and no entrepreneurs to drive innovation. All that is needed are efficient business managers. As a result, in NCE, entrepreneurs are merely agents in any form of business activity, including routine managers. This, in one fell swoop, conflates the innovative entrepreneur with the mainstream market conception of a capitalist as routine business operator.

More recently NCE has attempted, like a voyeur, to peer into the reality of the black box, all the time afraid to take part in the action going on for fear of contaminating its own a priori prejudices and thus destroying legitimacy of the standard economic model. Nobel Laureate Kenneth Arrow in 1962 developed two key neoclassical concepts on innovation that have been continually cited since then. Borrowing from psychology, Arrow (1962a) identifies learning-by-doing that occurs when new capital resources are introduced into the firm. Then he accepts other forms of learning as exogenous “production of knowledge”, that in Arrow (1962b) are absorbed into an algorithm for the incentive to innovate as a function of market competition and deduces that competitive firms have a higher incentive to innovate vis-à-vis monopolists. Thus, the price/profit guide to resource allocation remains sacrosanct in the pseudo-dynamic NCE world of innovation. Demsetz (1969) is critical of Arrow (1962b) because it compares monopolists with large output against much smaller outputs in perfect competitive conditions. As Kingston (1984, p. 10) notes, it is the imperfections creating market power that provide the above-equilibrium average return on physical investment which stimulate innovation. This critique of Arrow began a large heterodox strand of innovation economics thought in which the dynamic path-dependence of firms impacts on the incentive to innovate as much as the price-guided allocative system.

One brave and prominent NCE economist has attempted virtually single-handedly to save the innovative entrepreneur from the “black box”. William
Baumol (1968, p. 1) rejects the conflation of managing a business and the higher responsibility of driving innovation: “The entrepreneur is at the same time one of the most intriguing and one of the most elusive characters in the cast that constitutes the subject of economic analysis. He has long been recognized as the apex of the hierarchy that determines the behavior of the firm and thereby bears a heavy responsibility for the vitality of the free enterprise society. In the writings of the classical economist his appearance was frequent, though he remained a shadowy entity without clearly defined form and function.”

Despite this frequently cited 1968 quotation, due to the nature of the NCE model itself, economists have not been able to find a way to formally endogenise the entrepreneurial function. The two NCE approaches to innovation that do exist fail to endogenise the entrepreneur in economics. One is the Arrow-based incentives to innovation studies that are critiqued above. The other is new growth theory which brings technology into an endogenous growth function by sacrificing profit flow and investing in capital plant and equipment instead (Dixit and Pindyck, 1994) – but because it regards capital stock as homogenous, this implies no specific role for innovation. In these NCE approaches to innovation economics, the balance (or equilibrium) can ‘organically’ alter in a series of comparative static changes over logical (ahistorical) time, without the endogenous and dynamic intervention of the entrepreneur.

To his credit, Baumol has made attempts to incorporate entrepreneurial behaviour into the economics mainstream. The task is not easy when a major intellectual in NCE needs three books to do this, culminating in Baumol (2010), which serves a useful purpose in further conceptualising (along the lines of Schumpeter) the role of the entrepreneur in the economy from a rich vein of historical studies. However, the actual integration of the dynamic role of the entrepreneur in the static NCE model remains problematic. This is because Baumol models the decisions of entrepreneurs by an optimality algorithm where new and innovative entrepreneurial activities are subject to known constraints. If the economy is at an equilibrium measured in a static state, then the algorithm has a clear resolution, and the role of the entrepreneur is insubstantial. Leave it to the routine manager. At this equilibrium a potential exit exists where the dynamic entrepreneur is in her element. It is an ‘escape hatch’ from the static state. Where is Baumol’s optimising entrepreneur at this point? It is here that optimality breaks down because there is no way any optimal algorithm can provide an answer to this exit point. There is no theoretically logical and consistent way of escaping static optimality unless a stochastic shock is devised, which removes the endogeneity of the entrepreneurial spirit. Baumol (2010, p. 70) himself
admits this optimality problem by stating: “…nor does it provide any rigorous standards by which the issue can be judged.”

Furthermore, Baumol (2010, p. 100) argues: “In order to achieve optimality, one must eliminate the externalities and then correct any new, undesired redistribution effects that result.” This is the neoclassical market imperfections argument justifying public policy actions to ‘correct’ for externalities and ‘address’ inequality of distribution issues. Such actions brings one back to the static model and its inability to handle dynamic variables. What is the ‘correct’ action if there is no rigorous standard to evaluate public policy actions? Thus, the lack of an optimal endogenous entrepreneurial escape from the static state, although termed ‘market imperfections’, can be more accurately described as a systemic failure of markets (Smith, 1998). This failure leads to the total inability of NCE to provide theoretical understanding or empirical guidance for action. The contradictions within NCE in addressing innovation and the inability to specify an endogenous role for the entrepreneur who is responsible for innovation, leaves NCE with an apparently unresolvable lack of any rigorous research model for future study of innovation.

THE RESURRECTION OF THE ENTREPRENEUR BY SCHUMPETER

In The Theory of Economic Development, Schumpeter (1912) re-introduced endogeneity of innovation in his refocusing back on economic development in the capitalist process. This brings the innovative entrepreneur onto the centre stage of economic analysis. The entrepreneur for Schumpeter must be seen as the human agency, via innovation, of economic development. It is this agency role that makes the development process non-deterministic and instead, adaptive to complex changes: “The economy does not grow into higher forms by itself” he says. “The history of every industry leads us back to men and to energetic will and activity. This is the strongest and most prominent reality of economic life.” (Schumpeter, 1912, p. 75) In other words, human agency in the form of the entrepreneur is necessarily involved in effecting the innovations required for economic development.

In trying to understand the totality of the economy, Schumpeter divides economic processes into three categories or classes: “…into those processes of the circular flow; into those of development; and into those which impede the latter’s undisturbed course.” (1934, p. 218) By “circular flow” or statics, Schumpeter means that part of the overall economy that can be conceptualised as operating as a NCE general equilibrium system in which incremental
quantitative growth is achieved through stimuli such as changing consumer tastes in conditions of gradually increasing population, saving and capital accumulation. Importantly, there is no dynamics of endogenous development that results in qualitatively new phenomena.

Schumpeter, by this distinction between statics and dynamics, places the entrepreneur clearly into the dynamic process and questions the role of the entrepreneur in NCE. Either NCE accepts that its statics is only a partial analysis of a more complex real system, and cannot, therefore, make valid knowledge claims about the entire system; or it is claiming that the entire real economic system behaves as a self-reinforcing system in static equilibrium that maintains itself. The former interpretation can be seen as a realist view on the static approach that qualifies any knowledge claims deriving from it. The latter interpretation is fundamentalist and susceptible to knowledge claims derived from static analysis techniques; and thus questions the role of the entrepreneur within the neoclassical system.

In Chapter 2 of the second edition of Theory, Schumpeter describes the individuals who carry out new combinations as entrepreneurs in dynamic economic development. He immediately qualifies this, saying the concept is broader than a single individual: “…we call entrepreneurs not only those ‘independent’ businessmen in an exchange economy who are usually so designated, but all those who actually fulfil the function by which we define the concept, even if they are, as is becoming the rule, ‘dependent’ employees of a company, like managers, members of boards of directors, and so forth…” (Schumpeter, 1934, pp. 74-5).

The reason for this formulation is explained in a note in Schumpeter (1934, p. 61n) in which he challenges “…one of the most annoying misunderstandings that arose out of the first edition.” This was the suggestion that, in a variation of the ‘great man theory’, he had identified the individual entrepreneur as the prime cause of innovation and hence economic change. “If my representation were intended to be as this objection assumes, it would obviously be nonsense” he says and points out that his concern is not with “…the concrete factors of change, but the method by which these work…” An individual is “…merely the bearer of the mechanism of change” (Schumpeter, 1934, p. 61n, emphasis in the original), or simply, the agency for introducing novelty into the organisation. Such novelty is regarded by Schumpeter as disruptive to the current status quo in the production system, whether that is the firm, industry or the economy.

This interpretation of statics and dynamics is supported by concrete examples of how businesses organise for the two different types of change. For example, to bring a new product to market teams are typically formed
outside the normal hierarchical management structure and only exist temporarily while engaged in this activity. Introduction of new products is one of Schumpeter’s five types of discontinuous development. Once introduced as a new product; the tasks of support, and maintenance (including release of new versions), is typically the responsibility of a permanent unit within the normal hierarchy of the firm. A similar situation prevails in software development, where a specially formed project team will carry out the development of new application software, while a separate support department will handle the subsequent maintenance and new releases. More generally, organisations implementing small process improvements to production or administration systems will normally entrust these to existing line management. It is only when attempting more complex and revolutionary process re-engineering that the task will be allocated to a specialist project team outside the day-to-day management structure.

The distinction in an organisation is between the ‘dynamic’ entrepreneur as a mechanism of change vis-à-vis the ‘static’ manager as a mechanism of consolidation and optimisation. Across organisations, Baumol (2010) makes clear there are two different types within the category of “dynamic entrepreneur”. Crucially, and most importantly, there is the ‘true’ productive entrepreneur as a person (or team) which is productive in a welfare enhancing development process that adds to productive wealth. This is the type that Schumpeter envisages in his works. In contrast, Baumol recognises also the “disruptive entrepreneur” who is unproductive since the activity being engaged is only rent-seeking, like identifying previously unused speculative or illegal opportunities. The term “disruptive” is used by Baumol in a subjective manner to indicate economic activity that is anti-social and unethical; while the same term is used by Schumpeter in an objective manner to indicate the outcome of discontinuous development. When used in the context of Baumol’s subjective definition, the term needs to have quotation marks around it, i.e. “disruptive”.

The “disruptive” unproductive entrepreneur looks initially to be adding value through employment or stockholder value, as did the entrepreneurs who innovated the sub-prime mortgages and collateralised debt obligations during the early 2000s (see Kregel, 2008). Further down the track, such activity unravels into major costs to society and to the business community in general that far outweigh any initial positive value, as exhibited by the Global Financial Crisis resulting in a banking collapse in September 2008, followed by the long-running “Great Recession” (see Arestis, Karakitsos, 2010). Thus, inability to distinguish between such an unproductive (arbitrage) entrepreneur from a productive (innovative) entrepreneur is the
reason why the Austrian economics view of the entrepreneur – as an agent alert to opportunities for taking advantage of discrepancies and gaps in the market system (Kirzner, 1973) – is not relevant to this discussion of innovation economics.

Of course nothing in the Schumpeterian interpretation of an entrepreneur suggests that people who possess the ability to fulfil an entrepreneurial role may not be engaged on continuous innovation activities within the firm or organisation. However, they are not acting as an entrepreneur when they do so and their entrepreneurial skills and capabilities are therefore latent and dormant. Neither does it mean that innovative entrepreneurial activity cannot take place within a firm; simply that business creation that is truly innovative, and thus explaining economic development, has to consist of disruptive discontinuous change.

From Schumpeter’s economic development approach, expansion of credit is an important, but only secondary, part of the growth mechanism. Thus, the management of general levels of interest rates by central banks, as a means to encourage the uptake of available credit, is ineffectual in stimulating recovery from a recession. For example, under lowered interest rates or ‘quantitative easing’, firms’ reason that it is better (as Schumpeter says) to cease: “…to wonder why. In fact, it can be argued that the outcome is likely to be worse due to a two-fold dampening effect on the discontinuous innovation required to generate the growth required for the economy to emerge from recession.” (Schumpeter, 1935, p. 8)

Schumpeter (1935, p. 8) goes on to note that: “…any satisfactory analysis of the causes [of the cycle] must start with what induces that credit expansion…” and unless that credit demand is coming from entrepreneurs for the purpose of initiating discontinuous innovation, the expected economic development will not occur. Increasing the availability of cheaper credit to firms within the circular flow – as the US monetary authorities did (starting in late 2008) to stimulate the economy out of a post-Global Financial Crisis stagnant malaise – has the effect of, in the worst case, reducing costs, the benefits of which return directly to shareholders as companies seek to maintain their levels of dividend payouts to shareholders. In the best case, the reinvestment of profits stimulate investment in adaptive improvement which, by supporting the longevity of established businesses, reduces the likelihood of creative destruction occurring. In fact, the risk-adversity of firms in the circular flow, and their reluctance to undertake any significant innovative investment in recessionary conditions may tend to make the former outcome more likely than the latter. This is what Schumpeter refers to as the “two-fold dampening effect”; one is the increased dividend payout, the other is the induced preference for investment in minor incremental innovation.
A more effective monetary policy in recessionary conditions may be to hold general levels of interest rates steady while implementing policies to improve the flow of lower cost credit to potential entrepreneurs. Analysis of such a proactive policy is beyond the scope of this paper, but the objective would be to increase the flow of credit to dynamic discontinuous entrepreneurs while restraining the availability of lower cost credit to existing businesses. So, from this discussion of Schumpeter’s innovative entrepreneur within the economic system, innovation economics places entrepreneurial novelty at the centre of the economic development. In this system government policy for economic development needs to focus less on the monetary system and more on the IS as the primary enabler. This raises two other aspects of innovation economics which Schumpeter omits. One is the demand-side of innovation (to complement the strong supply-side Schumpeterian focus); the other is how to frame the IS. These aspects are discussed in the remainder of this paper.

THE NURTURING OF THE ENTREPRENEUR
BY KALECKI

To Kalecki, the demand-side focus comes from viewing entrepreneurs as making investment demand decisions to enable and nurture innovation, and this investment occurs in the short period. This is the Kaleckian approach to time, in which the long-run economic growth path is "a slowly changing component of a chain of short period situations" (Kalecki, [1968] 1991, p. 435). Like Schumpeter, Kalecki sees novelty in the same way and emphasises that "...innovations in the broadest sense [including opening up of new sources of raw materials] as the most important promoter of development" (Kalecki, [1954] 1991, p. 337). Kalecki regards short period innovation promotion as crucial, arguing that the "...influence of this factor is analogous to that of an increase in aggregate profits which in the course of a given period makes investment projects generally more attractive than they were at the beginning of this period." (Kalecki, [1954] 1991, p. 334) Through this process of innovation, together with innovation-induced profits (or other financial instruments), a dynamic secular growth path is generated. Thus this path, permitted by innovation which generates profits through investment in novelty, is the short period effective demand sequence which allows further innovation and investment in the next period. Business cycles and crises arise due to the fluctuation of profits.

Innovation has a technological driver component that leads to tangible investment which creates capital accumulation. This leads to a secular economic growth path identified from the Schumpeterian approach (Verspagen,
Technological innovation is the commercial implementation through tangible investment of new technical knowledge. This knowledge is derived from intangible investment in scientific or engineering developments on specific R&D activities or in the course of day-to-day production and marketing activity (Sahal, 1981, p. 42). Kalecki recognises intangible investment as the other driver of innovative behaviour which “...is largely concentrated on a ‘scientific organisation’ of the assembly process which does not involve heavy investment” (Kalecki, [1954] 1991, p. 335). This non-technological innovation component is based on creative application through intangible investment of human resources management and marketing knowledge. Intangible investment does not involve modifying technological processes or products, and requires relatively less expenditure. Together the two drivers form a technological-human capital duality that is crucial to the success of implementation of new ideas, and forms the chain of innovation from R&D through to prototype, tests, launch and complementary chattels. For Kalecki, technological innovation requires substantial tangible and intangible investments, which together enable innovative entrepreneurs to set up new means of production which establish the economy's accumulation path.

In this way, Kalecki sees disruptive, or what he calls “exogenous”, innovation as transformative that represents change through the intensity of innovation with given capital investment levels. This means that any change in the intensity of the innovation effect originates in the scientific invention or radical business opportunity identified as the source of the innovation. So that a: “...reduction in the intensity of innovations...will also initially cause a disturbance in the cyclical fluctuation and, by means of a slump more pronounced than the boom, will make for a lower long-run level of investment.” (Kalecki, [1954] 1991, p. 328) This would lower the long-run trend and cumulatively move the economy in the direction of stagnation, which is made up of a pronounced slump resulting in a long period of high unemployment and mark-up pricing by monopoly capital, as identified by Steindl (1979) using the Kaleckian model above. This is innovation to nowhere.

On the other hand, an increase in innovation intensity would raise the long-run trend in economic growth. Steindl (1981, p. 44) extends Kalecki's analysis by recognising that additional demand and profits from innovation spreads “rather far over the whole of industry” via diffusion as specified by Rogers (1995), while the supply-side capacity effects are concentrated “on the particular branch of the innovator”. At the macro-level, the economy will be growing if the steady stream of innovations boosts the demand effects more than the capacity effects. In support of raising the long-run trend growth towards full employment in this Steindlian manner, Guger et al. (2006) argue for a State technology policy as an instrument to stimulate innovation and concomitant
investment. Steindl (1968) in an OECD report supports this stimulating role for innovation by placing emphasis on human capital factors through State education policy to provide the skilled workers and learning environment (or in innovation terminology, 'absorptive capacity') for technology policy to be successful. This brings innovation economics to its modern focus on the IS that incorporates education, technology and science.

THE ENTREPRENEUR IN INNOVATION SYSTEMS: THE NEW APPROACH

Evolutionary economics is the modern day home of innovation economics. It is a broad overlapping church that includes institutional, systemic and neo-Schumpeterian economic thought in which the IS is central to their analyses. Under this approach, innovation policies need to be both active and positive in the direction of encouraging variety, fostering experimental behaviour, supporting new developments, focusing on system building, enhancing diffusion, promoting learning organisations and their skills training, as well as assisting to influence expectations (through broad-based grants, tax concessions, mentoring, and supporting small business services). The major contribution from this approach is the holistic perspective to analysis and policy, recognising interdependencies with dynamic evolutionary forces (see Witt, 2006). This requires complex economic dynamics that can identify systemic (rather than market) failure and interventionist policies to overcome such failures (see Smith, 1998). Many examples of success in this innovation approach can be noted: war-time economies, reconstruction from major devastation (e.g. the Marshall Plan), national sports academies, regional clustering around universities, and technology parks.

How does this approach characterise the innovative entrepreneur? This entrepreneur is the major actor within an institutional system that starts with R&D in which the aggregate body of investigation goes on continuously at different rates of intensity, and at different scales of activity (from small start-ups entrepreneurs to large corporate-based ‘intrapreneurs’). The large R&D spending and related innovation effects are bound to lead to some major new ‘discovery’ or ‘invention’ by the entrepreneur/intrapreneur which is related to the total aggregate R&D (and other invention activities). Discovery is linked to possible small developments in various laboratories and informal networks between firms and industries eventually coming to fruition in some way divorced of any specific competitive behaviour. New technological paradigms come out of such an environment and are the basis of structural change to a new long wave of boom and prosperity; but not yet!
Galbraith (1967) identifies the intransigence to structural change by the “technostructure”. This is the top management in which the decision-making basis of the large corporations forms “the planning system” of advanced capitalist economies. The system results in corporate dominance involving interlocking complex sets of innovation systems operating at global, national and sub-national (or regional) levels (Courvisanos, 2006). Using an institutional framework based on the seminal work of Freeman (1995) on national innovation systems, Perez (2002) explains how deployment of technological systems and paradigm shift arise only after all minor improvements (incremental innovation) are squeezed out of the old systems by ‘monopoly capital’ managers (“the technostructure”) who are protecting existing capital stock and thus delaying the new paradigm from taking over. There is also a ‘log jam’ in endogenous innovations based on the new paradigm which compounds the latter’s slow initial adoption. This occurs when established powerful capitalists, with much old capital stock, cannot justify the entire shake-up of industries, since not enough interrelated clusters have been formed. In some way (via collapse of speculative bubbles or insufficient effective demand), recessions send the old capitalists to the Marxian ‘dustbin’ of history. Innovative entrepreneurs’ reactions to uncertainty are influenced by competitive pressures and growing inefficiencies of old capital stock. This induces adaptation, deployment and diffusion of innovation, creating a new technological trajectory, establishing a strong investment upturn. At the same time this upturn re-establishes the conditions for a new phase of steady development. A paradigm shift occurs when the new adapted technological systems pervade the whole economy. This is a very sophisticated account of the path to renewal.

However, a lack of coherence and a weak PE perspective undermine this IS approach. The major problem is that the path to renewal is indeterminate because it crosses over diverse heterodox schools of economics that identify the dynamic innovation process, but have no coherent understanding of causal mechanisms that can unite them. Institutionalists see institutions continually and cumulatively changing due to innovation, leading to evolutionary transformation of socio-economic systems (e.g. Galbraith, 1967; Kingston, 1984). Neo-Schumpeterians use a biological evolutionary analogy to show how the innovative firm evolves and this has implications for macroeconomic development (e.g. Nelson, 2012). Systemic economics appreciates the role of innovation operating within a complex adaptive system (CAS) that is based on the strength of relationships within a system (e.g. Smith, 1998). A CAS implies that the more stable a relationship within a complex system, the weaker is the innovation with less resilience for absorbing variations under significant fluctuations. Also, the IS approach lacks two
features that appear in earlier economic thought on innovation literature outlined above. One is a problem of effective demand and how this limits any innovation path (Courvisanos, 2012), and the other is the lack of focus on market power and the consequent role for the State (Jessop, 1993).

CONCLUSION: A NEED FOR COHERENCE

The role that innovation plays in the discipline of economics is irresolute. Innovation emerged tentatively out of PE to provide a strong holistic and dynamic critical realist approach. PE views the entrepreneur as an economic agent who introduces under uncertainty either (or both) process innovation (Smith-Babbage) and product innovation (Marx) mechanisms. The emergence of NCE as mainstream economics led to the disappearance of the innovative entrepreneur in economics (Barreto, 1989), since NCE was unable to rigorously and reliably provide an endogenous role for the innovative entrepreneur. NCE left the entrepreneur to be merely the organising agency of the available resources of land, labour and capital within a static equilibrium model. Schumpeter, borrowing the alert opportunistic agent from old Austrian economics, resurrected from the ashes of PE the innovative entrepreneur and placed her at the centre of the economic development process in a dynamic but cyclical schema. This contribution by Schumpeter has had extremely limited influence on the mainstream (Nelson, 2012). Kalecki, adapting Marx’s entrepreneur into a monopoly capital world, identifies the investment demand aspect of the innovative entrepreneur to provide an enabling mechanism for public economic policy to operate. The systems approach incorporated within IS provides the only modern economics discipline base for innovation economics. This approach has diverse schools contributing, with different ontologies, to a lack of theoretical consistency on the nature of evolution in innovation. Further, in IS literature the focus is on systems, thus innovative entrepreneurs tends to fade in the background, becoming representative agents of innovation rather than distinctive outliers that are harbingers of the future which should be studied as a guide to understanding prospective paths of economic development.

This paper analyses the history of economic thought to trace the rise, fall and resurrection of innovation economics and find a coherent role for the entrepreneur in this body of theory. This past reveals diverse approaches with little coherence in the way the entrepreneur is characterised. What about the future? First, any innovation economics needs to begin with Schumpeter (on supply) and Kalecki (on demand), and their resurrection that depicts innovation as discontinuous and disruptive which results in the dynamics of
the business cycle; not some static system tending towards mechanical equilibrium. Second, the entrepreneur driving this process needs to be seen as an economic agent who introduces innovation mechanisms under uncertainty, operating in a complex, open and adaptive system. These are outlier agents who forge a future trajectory for economic development, not representative agents of a market system that is in static mode. Third, having accepted the above two points, then, the future task is to develop one coherent theory of innovation that is robust with conception of discontinuous innovation and the innovating entrepreneur who drives this process. Innovation economics does not currently have this. Schumpeter in his last few years addressed the problem of how such a theory can emerge. This is the fourth point, the need for deep study of entrepreneurial history in the context of major waves of technology-based innovation and the nature of human agency involved therein (Schumpeter, [1949] 1989). From such studies, various potential theories of innovative entrepreneurship will hopefully emerge that can be gauged against the principles stated in this paper, discarding theories that are not consistent.

The vital fifth and final point on the need for coherence is deeply theoretical and highly provisional. It is to explicate the demand-side mechanism that nurtures successful innovation from incubation to launch and on to being embedded in long-term acceptance, not as innovation, but as required standard products and processes. Absence of the demand-side from all existing theories of innovation – which from neoclassical, evolutionary and complexity theories all focus on the supply-side – needs to be addressed. Such a demand-side mechanism can only start with the work of Michał Kalecki on specifying tangible and intangible investment in innovation and also the fostering of effective demand through supporting public infrastructure and appropriate credit and monetary policies. This is a task for a separate research project; to incorporate a demand specification into supply-side innovation modelling. Embarking on this task, together with the other four points above, means the lack of coherence in innovation economics can be overcome. Only then can the study of innovation as economic development take place as Joseph Schumpeter had wished for.
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