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Innovation, Value-Neutrality and the Question of Politics: the Neo-Schumpeterian Divide

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Abstract: Since the reconstruction of Joseph Schumpeter's view of innovation as a key factor of capitalist economic development and the neo-Schumpeterian formation of national innovation systems theory in the early 1990s, there has been an attempt to approach the emergence of new technological products and processes in institutional terms. However, much of this neo-institutionalism has positioned innovation as if it was a value-neutral process of supply and demand, taking place in a free market and having nothing to do with politics and the state. I argue that such value neutrality is defended by some neo-Schumpeterian thinkers who take a socio-biological path to explaining innovation and technical change. By contrast, some other neo-Schumpeterian thinkers appear to acknowledge that capitalism itself is not a smooth and neutral process of socio-biological evolution but rather an uneven, value-bound and dynamic process of technological change. These thinkers take a historical path to explaining innovation and therefore are more consistent with Schumpeter's theory of economic development. This divide within the neo-Schumpeterian school of thought deserves further critical analysis.

1. Introduction

Since the reconstruction of Joseph Schumpeter's view of innovation as a key factor of capitalist economic development and the neo-Schumpeterian formation of national innovation systems (NIS) theory in the early 1990s (Lundvall, 1992; Nelson, 1990, 1992, 1993; Freeman, 1995; Freeman and Soete, 1997; Edquist and Johnson, 1997; Edquist, 1997), there has been an attempt to approach the emergence of new technological products and processes in institutional terms. However, much of this neo-institutionalism has positioned innovation as if it was a value-neutral process of supply and demand, taking place in a free market and having nothing to do with politics and the state.

In this paper, I argue that such value neutrality is defended only by some neo-Schumpeterian thinkers who take a socio-biological path to explaining innovation and technical change. I regard these thinkers as neo-Darwinians who are not necessarily consistent with Schumpeter's writings. Other neo-Schumpeterian thinkers do appear to acknowledge that capitalism itself is not a smooth and neutral process of socio-biological evolution but rather an uneven, value-bound and dynamic process of technological change. These thinkers take a historical path to explaining innovation and therefore are more consistent with Schumpeter's theory of economic development. This intellectual divide within the neo-Schumpeterian school of thought deserves further critical analysis. Can the theory of innovation be value neutral? Can the social and political context of innovation be ignored? Which neo-Schumpeterian camp is likely to influence innovation policy and practice?

The remainder of this paper is structured as follows. Section 2 reveals the intellectual divide within the neo-Schumpeterian approach to innovation as regards value-neutrality. Section 3 addresses the question of politics, analysing innovation as a social process that is driven by both value and power conflicts. Section 4 redefines innovation in terms of history and context. In doing so, it exposes the myth of universal social and political values. Section 5 concludes the paper by summarising the argument of innovation as a social and political process.

2. The Divide within the Neo-Schumpeterian Approach to Innovation: Value Neutrality

Generally speaking, the neo-Schumpeterian approach to innovation is characterised by two elements. The first is the systemic element, namely that innovation is an interactive process involving many different institutional actors. These actors tend to form a system of relations that can be *national* (Freeman, 1982, 1987, 1988; Lundvall, 1985, 1988), *regional* (Asheim, 1996; Asheim and Coenen, 2005; Cooke, 2006, 2007a, 2007b; Cooke et al, 1997; Braczyk et al, 1998), and/or *sectoral* (Malerba, 2002, 2004), facilitating learning and production of new technology goods and services. The second element of the neo-Schumpeterian approach to innovation is the evolutionary element, namely that economic and technological change happen in an evolutionary way through a mechanism of variation, selection and retention. Nelson and Winter (1982) introduced these core Darwinian principles to evolutionary economics of innovation and technical change in order to explain the dynamism of such processes within modern capitalism.

As has been argued elsewhere (Watkins et al, 2015) both the systemic and the evolutionary elements of neo-Schumpeterian approach constitute a response to the static neo-classical model of economic growth. Drawing on the work of Nelson and Winter (1982), evolutionary economists such as Freeman (1982, 1987), Freeman and Soete (1997), Lundvall (1985, 1988), Dosi (1982), Dosi and Nelson (1994) and many others persuasively argued that neo-classical growth models are inadequate as they tend to ignore the role of innovation in technological change and particularly in economies which are driven by strong science and technology to become competitive global forces. For these economists, technological change and innovation are central to economic growth. Thus, as Freeman and Soete (1997) have explained, since the industrial revolution of the 1780s, successive waves of technical change and institutional transformations have introduced innovations from textiles and railways to microelectronics and information and communication technologies (ICTs) which have radically improved the lives of people across the world.

However, it might be suggested that neither for Schumpeter nor for Freeman let alone Lundvall the evolutionary process of innovation is consistently socio-biological. Schumpeter, following Marx, on the one hand argues that capitalism can never be stationary, and on the other insists that economic evolution is not merely a systemic adaptation to changes in external data but rather it occurs discontinuously and far from smoothly (Schumpeter, 1983). In his *The Theory of Economic Development*, Schumpeter (ibid: 57-58) criticises the continuous enquiry for identifying the ‘meaning of history’ as metaphysical and argues against conceptions of uniform social development which draw on uncritical analogies with Darwin’s theory of evolution. As he says:

Closely connected with metaphysical preconception – more precisely with the ideas which grow out of metaphysical roots and become preconceptions if, neglecting unbridgeable gulfs, we make them do the work of empirical science – even if not itself such a metaphysical preconception, is every search for meaning of history. The same is true of the postulate that a nation, civilisation, or even the whole of mankind, must show some kind of uniform unilineal development, as even such a matter-if-fact mind as Rocher assumed and as the innumerable philosophers and theorists of history in the long brilliant line from Vico to Lamprecht took and still take for granted. Here too, belong all kinds of evolutionary thought that centre in Darwin – at least if this means no more than reasoning by analogy – and also psychological prejudice ... But the evolutionary idea is now discredited in our field, especially with historians and ethnologists, for still another

reason. To the reproach of unscientific and extra-scientific mysticism that now surrounds the “evolutionary” ideas, is added that of dilettantism. With all the hasty generalisations in which the word “evolution” plays a part, many of us lost patience.

Schumpeter’s criticism clearly indicates that he is sceptical of the biological tradition as a force of explanation of evolutionary economic phenomena. For him the structure of the problems is not the same in economics and in biology. In his *Business Cycles*, Schumpeter (1939: 102) argues that in fact ‘...evolution is lopsided, discontinuous, disharmonious by nature ... studied with violent outbursts and catastrophes ... more like a series of explosions than a gentle, though incessant, transformation’. In this sense, biological metaphors are not applicable to explaining innovation and therefore remain irrelevant.

Like Schumpeter, Freeman and Lundvall appear to exclude the biological analogy from their evolutionary approach to innovation and technical change. Instead, they deliberately choose a historical method of approach that is designed to illustrate the broad, interactive, relational but also conflictual and discontinuous elements of the system of production, diffusion and use of knowledge and innovation. Geels and Schot (2016) and earlier than them Andersen (2009) and Hodgson (1993) accept that the Schumpeterians in the socio-biological tradition of evolution focus narrowly on firms, knowledge, innovation and market selection whereas Freeman keeps ‘...the broad agenda alive ...’ (Geels and Schot, 2016: 11) and insists on the need to reintegrate economic theory with other social sciences, including politics, and on the importance of institutional change in innovation. These elements indicate the importance of values (e.g. freedom, equality, justice, etc.), interests (e.g. material interests) and power relations (e.g. control over) within modern innovation systems. Freeman and Lundvall’s methodological framework is holistic and goes beyond the micro-evolutionary analysis of innovative firm behaviour. According to Freeman and Soete (1997: 17) ‘In order to make useful generalisations about R&D in relation to firm behaviour it is essential to place growth of this phenomenon firmly in a historical context and also in the context of specific industrial sectors’. The macro-evolutionary process of history as such is different from the micro-evolutionary process of biology. Whilst the latter involves a mechanism of natural selection of genotypic and phenotypic characters that takes place in the back of social agents, the former involves a continuous conflict of values and material interests and power that takes place in the front of social agents.

The cognitive aspects of agents' decision making and the dynamic of their systemic interactions have been appreciated by both Freeman and Lundvall the same way as Schumpeter and Marx have appreciated the importance of (theoretical and practical) reason in human action. Indeed, as Hodgson (1993, 2002, 2003) has repeatedly argued, the principle precursors of socio-biological approach to economics are in fact Thorstein Veblen and Friedrich von Hayek who '...applied the Darwinian principles of variety, selection and retention to economic phenomena. Despite evolutionary credentials that are genuine in some broad sense, the same cannot be said for others, including Karl Marx and Joseph Schumpeter. They did not apply the key Darwinian principles to their economics'. Clearly, Hodgson's view of Schumpeter is not shared by economists such as Saviotti and Metcalfe (1991) who discussed the status and prospects of evolutionary theories of economic and technological change, insisting that Schumpeter's approach to innovation contains several elements embedded in modern socio-biological theories of evolution, including that of Nelson and Winter (1982). The same holds for a younger generation of evolutionary theorists such as Geels (2014) who seem to use biological metaphors to explain the domination of certain technologies and innovative designs in the market but also the domination of cognitive frames or paradigms of analysis. For them, the same way, more or less, as organisms develop variations in order to adapt to environmental conditions and get naturally selected for survival, firms seek to differentiate themselves through product and process innovations which enable them to adapt to economic conditions and get selected within the market. According to Saviotti and Metcalfe (1991: 1):

In biology organisms can reproduce (generally sexually) and pass on their genetic make up to their offspring. The meaning of reproduction is much looser in economics but relates to the maintenance of productive competence over time, and integral to this is the generation and storing of information. Organisations and technologies tend to show some continuity in the course of time, although the pace of change can be much faster and more discontinuous than in biological evolution.

Although discontinuity is clearly recognised by these evolutionary economists as an important element of technological change, their main emphasis remains on the relatively smooth process of occurrence of various rule-guided behaviours which become routines within firms. As Nelson and Winter (1982: 97) stress, routines:

...may refer to a repetitive pattern of activity in an entire organisation, to an individual skill, or, as an adjective, to the smooth uneventful effectiveness of such an organisation or individual performance.

More importantly, they claim, routines are analogous to genes. This implies that vital information for organisational survival are stored in routines. Evolution then depends on whether such information enables better adaptation to market conditions and competitive environments. Dosi (1982, 1988) and other followers of the socio-biological approach to innovation and technical change at the firm level have built on the notion of 'routines as genes' to introduce the concept of 'technological paradigm' that in the words of Dosi and Nelson (1994: 161):

...attempts to capture both the nature of the technological change upon which innovative activities draw and the organisational procedures for the search and exploitation of the innovations.

This concept justifies modelling of technological change in terms of two determinants: first the 'firms' with their routines which embody knowledge and information for survival; second, the profitability of a new technology that determines its 'fitness'. Both determinants explain innovation processes at micro level, failing to account for the complex and contradictory system of social and political relations at macro level. The 'dialectics' of the latter has been clearly captured through the notion of innovation systems introduced by more consistent neo-Schumpeterian thinkers such as Freeman and Soete (1997), Lundvall (1992) and Edquist (1997). These thinkers stressed that not only the market mechanism and firms (micro level) but also the state and politics (macro level) play key roles in innovation systems. As Freeman and Soete (1997: 14) put it:

The market mechanism can be useful technique for allocating resources in certain rather specific circumstances, but it has its limitations, so that the definition and implementation of social priorities for science and technology cannot be left simply to the free play of market forces ...The political system is inevitably involved...

It might be argued that neither the political system nor the state can be seriously understood as important determinants of innovation by neo-Darwinians and their approach to evolution and technological change. The reason is pretty simple: neo-Darwinian economists of innovation tend to think of evolution as a process of value-neutrality whereas more consistent neo-

Schumpeterian thinkers understand evolution as a process that involves value judgements, including moral and political judgements about the normative direction of science and technology and innovation. The value-neutral position of neo-Darwinian thinkers can be realised when one revisits the early writings of Nelson and Winter (1982), Savioti and Metcalfe (1991), Dosi (2013) and more recently Geels (2014) and others. These authors seem to rule out or at least underplay the vital importance of moral and political judgements in human action and social evolution. For them what matters seem to be the mechanisms of coordination and adaptation and selection as if the market as such was a socio-biological organism and not a historically developed institution founded upon the liberal state that protects exploitative relations of individual property rights and guarantees capitalist forms of economic exchange based on supply and demand.

However, as Commons (1924) and later Penrose (1952) have pointed out, institutional evolution involves ‘artificial’ selection. This implies that human (individual and collective) action is intentional, guided not only by economic values and material interests but also by moral and political values. There is no such thing as pure calculative behaviour. Thus, it is clear that neither markets nor innovation systems evolve spontaneously as value-free or neutral mechanisms. Rather they are embedded in value-bound social, political and cultural relations. These relations are characterised by antinomies. This means that their evolution is driven by both value and power conflicts. Such conflicts are apparent in state planning where decisions about investment in new technologies take place. Against the myth of selection in markets and institutional environments, Block and Keller (2011) clearly show the expanded role of government and the state planning in both funding of and engaging with big innovation projects.

3. The Question of Politics: Value and Power Conflicts in Innovation

If it is true that innovation is not a value-neutral process of socio-biological evolution, then it must be also true that it cannot be abstracted from politics. The latter is also a process of change that involves intentional human action and historical development of complex institutions such as the state. Social and political theorists from Hobbes (1651) and Weber (1904) to Poulantzas (1978) and Jessop (1990) have defined the modern state in different ways. However, all of them, tend to agree the state is a distinct set of institutions with dedicated administrative staff

that has legitimate monopoly of authoritative and rule-making power within a bounded territory (Hay and Lister, 2006).

Although the concept of politics as an activity whereby individuals and groups change or maintain ways of social reproduction (Papaioannou, 2012) and the notion of state as an institutional ensemble that evolves over time (Hay and Lister, 2006) have been central in political studies for the understanding of social evolution, they have been side-lined or even abandoned in the mainstream innovation studies. As Steinmueller (2013: 161) recently confesses:

Our field [innovation studies] has an uneasy relationship with ...politics. No doubt this is partially the consequence of the fact that so many of us are economists, a tribe that paradoxically dominates public administration while at the same time harbouring severe doubts about public purposes. This is reflected in our programmes of research and training – we rarely engage with scholars of law, public administration, social policy, or education, and even less with political theory, ethics or philosophy.

The abandonment of politics in the mainstream (value-neutral) studies of technological innovation has sent out the wrong message that ‘...government is the problem, not the solution’ (Block 2011: 1) and that the markets are self-regulating mechanisms of socio-biological evolution that can solve problems of technological innovation without external (value-bound) political interventions. This message has been received and uncritically endorsed by current conservative and neo-liberal governments. For example, in his *Eight Great Technologies* report, Rt Hon David Willets MP, former Minister for Universities and Science in the UK, argues:

After the failure of the economic interventionism of the 1970s and the triumph of the liberal revolution in economic policy of the 1980s, we are wary of government picking winners. In so far as government can raise growth, we tend to focus on measures that apply across the economy as a whole – such as deregulation or lower corporate taxes or ease of setting up a business (Willets, 2013: 53).

Willets’s argument clearly defends neutrality. Therefore it is in line with the neo-liberal approach to economics and politics (Hayek, 1960; Nozick, 1974; Friedman, 1962) but not with the consistent neo-Schumpeterian theory of innovation and technical change (Freeman and Soete, 1997; Perez, 2002). The latter maintains that politics and the state have not (and should

not) been neutral to innovation. Rather they have been playing key roles in technological evolution, especially since the First World War. According to Freeman and Soete (1997: 375):

The First World War stimulated the growth of government support for scientific research and development in many countries, as for example, in the establishment of the Department for Scientific and Industrial Research (DSIR) in Britain in 1915 ...This continued as an agency in support of civil science down to 1960s, controlling a variety of government laboratories and funding university research. Similar developments occurred in many countries but it was the Second World War and the Cold War which led to the greatest surge of government funding of R&D. This took the form of massive support for huge projects, of which the most famous was the 'Manhattan Project' to design and develop nuclear weapons. It was followed by the establishment in many countries of large institutions for R&D in the military and civil applications of nuclear energy.

Given the value-bound and political nature of all these historical developments, it is clear that technological innovation has been not just a scientific and/or technical process of introducing new products and processes but also a political process of value and power conflicts. Public funding for basic research in areas such as nuclear power, genomics, biotechnology, information and communication technologies (ICTs), etc., has been highly contested in terms of political and moral justifications. Thus, none of these technologies came about as an unintended outcome of human action. Take for example the biotechnology phenomenon:

Where most previous accounts assume that the biotechnology revolution was spontaneously generated by the confluence of scientific discovery and profit-seeking incentives ...[in fact]...political structures and federal policy have played an equally critically but as yet insufficiently acknowledged role (Vallas et al, 2011: 57).

Most previous accounts, apparently influenced by liberal and neo-liberal thinkers, including Hayek and Friedman, have argued for a market fundamentalism in science and technology. Their arguments have been implicitly founded upon principles of negative freedom (i.e. freedom from) and equality before the law (Berlin, 1969; Papaioannou, 2012). For them, public funding for specific research and innovation projects ought to be withdrawn because the liberal state as such ought to remain neutral towards particular conceptions of the technological good, therefore also the economic and social goods. By contrast, consistent neo-Schumpeterian thinkers, including Freeman and Perez, have argued for state intervention explicitly founded

upon principles of positive freedom (i.e. freedom to) and substantive equality. In their view, cessation of public support to scientific research and innovation would have disastrous long-term consequences for both economic growth and social welfare in most countries because it is highly unlikely that free markets would compensate for the collapse of the state funding.

It might be suggested, that only very recently innovation studies has begun a conceptual and empirical return journey to Freeman and Perez's consistent neo-Schumpeterian writings, gradually moving away from socio-biological notions of evolution and value neutrality, and to progressively concentrating on the importance of politics and the state for innovation. The main reasons for this return are the shocking polarisation and growing inequality for which socio-biological innovation studies are also to blame (in the sense of rejecting state intervention in the supposedly smooth ecosystem of innovation) and the myth of 'invisible hand' in the market. Thus, scholars such as Block (2011: 3) reconstruct Freeman and Perez's theories, arguing that:

The historical experience with the innovation economy provides powerful arguments against the core assumption of market fundamentalism. For many technologies, it has not been Adam Smith's invisible hand, but the hand of government that has proven decisive in their development.

Indeed, Block and Keller (2011) refer to a number of examples which back this argument. These include: *Google* – the algorithm or the so called 'secret sauce' that made Google a successful search engine was initially funded by the United State (US) National Science Foundation (NSF); *Apple* – the dramatic growth of the computing industry in Silicon Valley is due to the US Defence Advanced Research Projects Agency (DARA) critical role in setting the context for growth of personal computing; *Human Genome Project* – the technological goals and funding for this projects were set by government through the National Institute of Health (NIH) and the Department of Energy and the Strategic Computing Initiative by DARA; Biotechnology industry – the emergence and growth of this industry is due to NIH and NSF support as well as government legislation that allowed the transfer of scientific discoveries made in publically funded universities and laboratories into private hands e.g. the Bayh-Dole Act (1980), the Stevenson-Wydler Act (1980) and the Orphan Drug Act (1983). Indeed, as Vallas et al (2011: 66) point out:

When taken as a whole, the pattern of state intervention ... suggests that the knowledge economy did not spontaneously emerge from the bottom up but was prompted by a top-down *stealth industrial policy*: government and industry leaders simultaneously

advocated government intervention to foster the development of biotechnology industry and argued hypocritically that government should ‘let the free market work’.

In her work *The Entrepreneurial State*, Mazzucato (2011, 2014) has built on these consistent neo-Schumpeterian arguments, especially on Perez (2002) and Block and Keller (2011), to challenge the value-neutral and rather minimalist view of the state and politics in technological innovation. According to the early version of her argument (published as a report for DEMOS, 2011: 16-17):

...the role of the government, in the most successful economies, has gone way beyond creating the right infrastructure and setting the rules. It is a leading agent in achieving the type of innovative breakthroughs that allow companies and economies to grow, not just by creating the ‘conditions’ that enable innovation. Rather the state can proactively create strategy around a new high growth area before the potential is understood by the business community (from the internet to nanotechnology), funding the most uncertain phase of the research that the private sector is too risk-averse to engage with, seeking and commissioning further developments, and often even overseeing the commercialisation process. In this sense it has played an important entrepreneurial role.

Certainly, Mazzucato’s argument is not founded upon a political theory of the state. In fact, it is not clear whether her understanding of the state is Weberian, liberal, pluralist, structuralist, etc. This lack of theoretical foundations is a particular weakness of Mazzucato’s argument for the entrepreneurial state. One can raise several questions here. Would a Weberian state (and indeed any other form of the state) be able to function as an entrepreneurial state? What are the theoretical presuppositions of such a state given that the Schumpeterian notion of entrepreneurship is strictly focused on individuals and not on political institutions? In the later version of the same argument (published as a book) Mazzucato (2014: 3) explains that the reason why she talks of ‘entrepreneurial state’ is that:

...entrepreneurship – what every policymaker today seems to want to encourage – is not (just) about start-ups, venture capital and ‘garage thinkers’. It is about the willingness and ability of economic agents to take on risk and real *Knighian* uncertainty: what is genuinely unknown.

However, there are two issues with her explanation that need to be addressed. First of all, Schumpeter would reject the idea that entrepreneurship is about taking on risk. In his *The Theory of Economic Development* (1983: 137) he clearly argues:

The entrepreneur is never the risk bearer ... The one who gives credit comes to grief if the undertaking fails. For although any property possessed by the entrepreneur may be liable, yet such possession of wealth is not essential, even though advantageous. But even if the entrepreneur finances himself out of former profits, or if he contributes the means of production belonging to his 'static' business, the risk falls on him as capitalist or possessor of goods, not as entrepreneur.

Clearly, if Schumpeter is right in what he argues then Mazzucato is wrong. That is to say, the state cannot play the role of entrepreneur in Schumpeterian terms but rather finance entrepreneurship through taxation. This brings us to the second issue with the above argument which is that the state is not just an economic agent; it is a predominantly political agent and therefore any state function presupposes political legitimacy. Therefore, financing entrepreneurship through taxation is not straightforward because it requires political legitimacy and justification, given that there are many other state priorities of redistribution (e.g. financing health through taxation, financing education through taxation, etc.). Mazzucato also seems to confuse the state with government and for this reason it is difficult for us to tell what kind of institution she has in mind for promoting innovation-led growth.

However, despite conceptual issues and lack of theoretical foundations, Mazzucato's argument is powerful, constituting an implicit political critique of the value-neutral and socio-biological approach to innovation. As has been shown elsewhere (Papaioannou et al, 2009), this approach by using strong metaphors such as 'knowledge ecology' and 'innovation ecosystems' misses the concrete historical and political dimensions of knowledge and innovation environments. These dimensions are by no means value-neutral. Rather, they are reflexive of what Stirling (2014: 4) calls 'politics of choice in innovation' i.e. not just technically but also morally and politically chosen innovation pathways. Given that some of these pathways can quickly become irreversible, it is important to be politically and morally scrutinised at the earliest stages of innovation (ibid). Although, the debate of whether value pluralism is possible in developed and developing capitalist societies is still ongoing, one might agree with Stirling that the interests and motivations are not purely scientific but also moral and political. This also implies power

conflicts mediated by the state that, in essence, provides normative direction to innovation in a number of contexts, including some developing countries e.g. Brazil, China and India.

4. The Importance of History and Context

Rather than treating existing and emerging patterns of technological innovation as socio-biological and value-neutral, I propose to re-define them as both historical and contextual patterns. This does not only reveal the political nature of innovation for development but also debunks the myth of universal values and institutions. As has been argued by Srinivas (2012: 1), development as such ‘...is a menagerie that houses many institutional varieties – especially of states and markets’. More specifically, markets take different forms in different historical and political contexts. In some countries markets are absent and in some others they are underdeveloped.

In any case, markets are not spontaneously created institutions which fail or succeed to deliver innovation-led growth and economic prosperity. Rather they are historically created through a complex process that involves both technological advance and the state. Indeed, as has been pointed out elsewhere (ibid: 2):

Even when dysfunctional or outright malevolent, and despite its limitations and contradictions, the state (and its governments) is inevitably the most important planning institution in these economies.

The same also holds true for developed capitalist countries. An increasing number of economists and political scientists (Perez, 2002; Block and Keller, 2011; Vallas, et al, 2011; Lundvall, 2013; Mazzucato, 2014) now agree that the political state has been the main driver of radical innovations with long-term effects for advanced economies and societies. Through the strategy of mission-oriented investments but also through the formalisation of normative directions for national, regional and sectoral innovation systems, the state has been actively promoting technological change. According to Mazzucato (2013: 196):

...the mission-oriented investments ... make up about 75 per cent of public sector investments in innovation in many advanced economies ... Such missions, from putting ‘a man to the moon’ to developing the Internet (which was done through DARA ...) are driven not by the dynamics of the private/social ‘wedge’ but by direct objectives of

government in question. Indeed, almost all general purpose technologies were fundamentally state funded’.

Government objectives are always justified in terms of certain moral and political doctrines which provide the overarching principles of political action and legitimacy. These doctrines include liberalism, neo-liberalism, socialism and social democracy. Clearly, since the 1980s, the justification of government objectives has been in terms of neo-liberal principles of individual freedom and equality before the law. The extension of these objectives to developing countries through the so called ‘Washington Consensus’ and ‘Structural Adjustment Programmes’ has failed to deliver across a range of regions, including Latin America, Sub-Saharan Africa and Eastern Europe (Papaioannou, 2014). The neo-liberal doctrine behind the state of innovation in the last quarter of the 20th century has instead led to phenomenal inequality that now poses a fundamental challenge to sustainable prosperity in the 21st century (Ince, 2014; Pikety, 2013). This top-down science and technology (S&T) based innovation has claimed to be value-neutral but in practice has been a major contributing factor to the growing divide between rich and poor (Krugman, 2002; Chataway et al, 2014). Evidence suggests that how S&T based innovation is framed is a serious barrier to its usefulness in resolving major problems of global justice (Papaioannou, 2013). Top-down innovation has been hierarchical and largely conducted separately from other non-government efforts to tackling major global challenges, notably in health, agriculture and energy. Therefore, it has excluded important segments of the population, failing to address inequality and the potential for long-term socio-economic prosperity.

In response to supposedly value-neutral, yet hierarchical and exclusive innovation that has been directed towards meeting the needs of rich winners in globalised markets, new models of innovative pro-poor products and services have emerged. These more inclusive models of innovation have not been spontaneous by-products of globalised markets but deliberate and value-bound efforts of civil societies and political states to innovate in conditions of scarcity. According to Srinivas and Sutz (2008: 132-133):

...scarcity-induced innovations (SII) [are] emerging from at least four important characteristics.

Cognitive: a) the canonical set of solutions can be relatively obscure and even absent from the mental landscape of the innovator, b) the innovator, even being aware of such set, is unable to use it and faces the need to address the problem differently.

Institutional or physical: lack of supporting organisations, laws, and technical instruments.

Socio-economic: a) when problems affecting developing societies have not been tackled at all b) existence of policy biases or c) solutions available are unaffordable, and new searching avenues need to be pursued ...

SII do not “scale up”. Individual capabilities do not translate into appreciable transmissible means of knowledge. SII are, more often than not “encapsulated” innovations. They can be “locally strong” yet remain isolated.

These four characteristics of SII cannot be easily understood by those neo-Schumpeterian thinkers who conceive innovation in socio-biological and value-neutral terms. In developmental contexts, mechanisms of variation, selection and retention are vague whilst firms and routines barely exist in the way that such thinkers assume. Instead, there are innovation problems which need to be addressed with particular political and moral values in mind e.g. reduction of unjust poverty and inequality through innovation.

Certainly the response of neo-Darwinian thinkers to my criticism might be simply that:

Darwinism provides an overarching framework of explanation, but without claiming to explain every aspect of detail ... Selection is the general principle, but it operates in different ways ... The sources of variation are very different in different contexts ... the transfer of Darwinian principles from biological to social evolution does not imply that the detailed mechanisms of variation, selection and inheritance are similar... (Hodgson and Knudsen, 2004: 15).

But if it is true that there is no implication of similar biological mechanisms working in social evolution then why some neo-Schumpeterians insist in the relevance of Darwinism for innovation studies in the first place? The answer might be found in their belief that the market is predominantly a value-neutral mechanism that needs to keep itself away from state planning. Other neo-Schumpeterians such as Geels and Schot (2016: 26), for example, are aware of the fact that critical sociologists and political theorists and STS scholars are:

... allergic to evolutionary theories for three reasons. First, they associate evolution with developmentalism and teleology, with a master process driving societies through different stages towards a presumed end-state Second, they fear that biological

analogies do not sufficiently acknowledge differences between humans and animals. Third, they assume that evolution proceeds through impersonal mechanisms with little room for agency e.g. blind mutations and market selection in evolutionary economics.

Geels and Schot (ibid) make a genuine effort to alleviate the concerns of critical sociologists, political theorists and STS scholars by emphasising the flexibility and broadness of socio-biological evolutionary concepts. However, what they seem to miss is the a-political nature of these concepts. This is in fact what critical sociologists, political theorists and STS scholars are allergic to: they find it difficult to explain technological evolution or sustainability transitions in abstraction from politics and the state. For them, who influences these institutions and shapes both funding and public opinion toward normative directions of innovation is important.

5. Conclusion

Neo-Schumpeterian thinkers are far from constituting a unified school of thought in innovation. In fact, as I have tried to show, there is a clear intellectual divide within this school of thought. Some neo-Schumpeterian thinkers tend to adopt value-neutral approaches and in this sense they are inconsistent with Schumpeter's theory of economic development. Most of these thinkers work within socio-biological frameworks of technological change and evolution, and tend to abstract from historical processes of value formation which influence the normative and political direction of innovation systems in developed and developing contexts. By contrast, some other thinkers appear to be more consistent neo-Schumpeterians, taking history and values seriously in their analysis of technological innovation. In doing so they understand politics and the state to be factors of generation of novel products and processes. For consistent neo-Schumpeterian thinkers the direction of innovation systems is predominantly normative and political. By contrast, socio-biologists are non-directional since for them the evolution of new technologies is a blind and non-teleological process of development. In conclusion, it might be said that independently of approach, neo-Schumpeterians need to explain better new emerging models of innovation and technical change, especially in developing countries. These models are political and go beyond the classical notion of innovation based on individual entrepreneurship.

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