

4. How Does Social Innovation Challenge Neo-Classical Economic Assumptions Regarding Technological Innovation?

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4.1. Introduction

Various economics paradigms treat innovation in fundamentally different ways. This paper focuses on neo-classical economics, in comparison with classical economics along their major assumptions, notions, research questions, and methods from the point of innovation in general, and social innovation, in particular.

The paper is structured as follows. Section 4.2 recalls briefly that innovation had been a major theme in classical economics. Then Section 4.3 shows that neo-classical economics essentially abandoned all research questions concerned with dynamics, and instead focused on optimisation. In this framework only certain types of innovations can be analysed.

Given abundant empirical findings and theoretical work on firm behaviour and the operation of markets, mainstream industrial economics and organisational theory has relaxed the most unrealistic assumptions of neo-classical economics, especially perfect information, deterministic environments, perfect competition, and constant or diminishing returns. Yet, several major shortcomings have remained: (i) institutional issues are not addressed satisfactorily in these branches of economics, either; (ii) a very narrow concept of uncertainty is used; (iii) no adequate theory is offered on the creation of knowledge used in innovation activities and technological interdependence amongst firms; and (iv) the role of government is not analysed in a way that would provide a sound and constructive guidance to policy-makers. (Fagerberg et al. eds., 2005; Foray ed., 2009; Lazonick, 2013; Lundvall and Borrás, 1999; Smith, 2000) Evolutionary economics of innovation – drawing also on institutional economics – rests on radically different postulates compared to mainstream economics. These latter schools, however, are not discussed in this contribution.

The main question of this paper, that is, how social innovation challenges neo-classical economic assumptions regarding technological innovation is addressed in the concluding section.

Innovation is a modern term – first applied extensively in economics by Schumpeter –, and thus authors belonging to classical and neo-classical economics have not used it. For the sake of simplicity, however, this notion is ‘retrospectively’ introduced in certain parts of this paper.

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4.2. Technical, organisational and institutional changes: a subject in classical economics

Although classical economics cannot be regarded as a paradigm – in terms of having shared axioms, basic notions, research questions, methods, postulates or main theses – it can be safely generalised that major classical economists had put a strong emphasis on technical, organisational and institutional changes when analysing “*the Nature and Causes of the Wealth of Nations*”, the “*Principles of Political Economy*”, or “*the Principles of Political Economy and Taxation*”. More generally, these authors had paid attention to historical developments (long-term issues) and thus to the dynamic nature of the economy and considered it embedded in political and social structures.

A fundamental notion in *Adam Smith*'s theory is the division of labour, that is, an organisational innovation, using modern terminology. In developing his arguments, further aspects of innovations are also explained – such as learning, introduction of machinery, better organisation of production processes – and various sources of innovations are mentioned.

“This great increase of the quantity of work which, in consequence of the division of labour, the same number of people are capable of performing, is owing to three different circumstances; first to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many. (...)”

(...) the invention of all those machines by which labour is so much facilitated and abridged, seems to have been originally owing to the division of labour. Men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things. But in consequence of the division of labour, the whole of every man's attention comes naturally to be directed towards some one very simple object. (...) A great part of the machines made use of in those manufactures in which labour is most subdivided, were originally the inventions of common workmen, who, being each of them employed in some very simple operation, naturally turned their thoughts towards finding out easier and readier methods of performing it. Whoever has been much accustomed to visit such manufactures, must frequently have been shewn very pretty machines, which were the inventions of such workmen, in order to facilitate and quicken their own particular part of the work. (...)

All the improvements in machinery, however, have by no means been the inventions of those who had occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by that of those who are called philosophers or men of speculation, whose trade it is not to do any thing, but to observe every thing; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects.” (Smith, 1776/1904; sections 1.1.5; 1.1.8; 1.1.9)

Just to mention another ‘modern’ issue, Smith (1776) also devoted a chapter to describe the co-evolution of transport technologies, markets, and division of labour, leading to economic development. His examples stretch from the case of ancient Egypt to his contemporary Holland in time and cover Africa, Asia and Europe in space. (Book I, Ch. III)

John Stuart Mill also identifies various types of innovations – technical, managerial and organisational, and financial –, and distinguishes invention from innovation (practical use) and incremental innovations during diffusion. Using modern terms, he also speaks of product and process innovations. Finally, he stresses the importance of diffusing new knowledge.

“§4. The third element which determines the productiveness of the labour of a community, is the skill and knowledge therein existing; whether it be the skill and knowledge of the labourers themselves, or of those who direct their labour. No illustration is requisite to show how the efficacy of industry is promoted by the manual dexterity of those who perform mere routine processes; by the intelligence of those engaged in operations in which the mind has a considerable part; and by the amount of knowledge of natural powers and of the properties of objects, which is turned to the purposes of industry. That the productiveness of the labour of a people is limited by their knowledge of the arts of life, is self-evident; and that any progress in those arts, any improved application of the objects or powers of nature to industrial uses, enables the same quantity and intensity of labour to raise a greater produce.

One principal department of these improvements consists in the *invention* and *use* of tools and machinery. (...)

The use of machinery is far from being the only mode in which the effects of knowledge in aiding production are exemplified. In agriculture and horticulture, machinery is only now [1852] beginning to show that it can do anything of importance, beyond the invention and *progressive improvement* of the plough and a few other simple instruments. The greatest agricultural inventions have consisted in the direct application of *more judicious processes* to the land itself, and to the plants growing on it (...). In manufactures and commerce, some of the most important improvements consist in economizing time; in making the return follow more speedily upon the labour and outlay. There are others of which the advantage consists in economy of material.

§5. But the effects of the increased knowledge of a community in increasing its wealth, need the less illustration as they have become familiar to the most uneducated, from such conspicuous instances as railways and steam-ships. A thing not yet so well understood and recognised, is *the economical value of the general diffusion of intelligence among the people.*” (Mill, 1848/1909, Book I, paragraphs 1.7.9-1.7.12)

In his major book, Ricardo has also analysed major marketing and technological changes, for example “Sudden Changes in the Channels of Trade”, “the influence of machinery on the interests of the different classes of society”, on output, trade, profit, and employment. (Ricardo, 1817/1821, chapters 19 and 31)

The way, in which Karl Marx has addressed technological changes and economic development is analysed in detail by many authors, most notably by Schumpeter (1942) [cf. Rosenberg, 2011], as well as by contemporary scholars of economics of innovation (e.g. Clark and Juma, 1988; Mazzolini and Nelson, 2013), and thus there is no need to stress here that Marx had paid attention to innovation.

To conclude this brief overview, it is worth stressing that classical economists had not paid a particular attention to the allocation of scarce resources. Following Kaldor (1972), two functions of decentralised markets are identified by Dosi and Orsenigo (1988, p.14): allocation of resources and transmission of impulses to change. To generalise, classical economists had inclined to focus on the latter one.

“Fundamental dynamic properties such as the relationship between expansion of markets, division of labour, and productivity growth in Smith, or the ‘increasing organic composition

of capital' in Marx, are examples of a class of propositions argued on the grounds of the *irreversible transformations* originated by processes of what we could call 'dynamic competition'. Moreover, their neglect of explicit microfoundations was justified on the grounds of what we may term a 'holistic' or 'macroinstitutional' assumption about behaviour: it seemed obvious to them that, for example, given an opportunity, capitalists were ready to seize it, or that their 'institutional' function was to invest and accumulate the surplus." (*ibid.*, emphasis in the original)

4.3. Technical, organisational and institutional changes: exogenous factors in neo-classical economics

Neo-classical economists abandoned the classical tradition at least in two crucial aspects: (i) they put allocative efficiency into the centre of their analysis, that is, a short-term issue; and closely related to this rupture, (ii) neglected technological, institutional, behavioural and organisational changes. Their main new objective was to develop sophisticated models of general equilibrium and by doing so to turn economics into a 'hard science', exemplified by Newtonian physics in the 19th century. Walras (1874/1954, p.71), for example, perceived "the pure theory of economics or the theory of exchange and value in exchange" as a "physico-mathematical science like mechanics or hydrodynamics". (cited in Clark and Juma, 1988, p.206)⁵⁵ In other words, a rich set of historical analyses offered by classical economics was replaced by an ahistorical, highly abstract theory.

Since the late 19th century, however, economists – representatives of various schools who criticise each other, on the one hand, and methodologists and historians of economic thought, on the other – use the label of neo-classical in various ways. Two different approaches can be distinguished. (Lawson, 2013) First, this school is defined in relation to classical economics, assuming both continuity (in some aspects) and discontinuity (in others). Many of the authors following this approach establish that hardly any continuity can be found, and thus counter-classical or anti-classical would be more appropriate designations.⁵⁶ Second, other authors seek to define common analytical features of writings labelled as neo-classical, that is, continuity with classical economics is not an issue in this (classification) approach. There is a non-negligible

⁵⁵ For a more detailed account on this 'zeal' and its repercussions, see, e.g. Allen (1988, pp.96-97), as well as Clark and Juma (1988, pp.204-207). In his Nobel memorial lecture, Herbert Simon (1978, p.367) also touched upon this issue: "The social sciences have been accustomed to look for models in the most spectacular successes of the natural sciences. There is no harm in that, provided that it is not done in a spirit of slavish imitation. In economics, it has been common enough to admire Newtonian mechanics (or, as we have seen, the Law of Falling Bodies), and to search for the economic equivalent of the laws of motion. But this is not the only model for a science, and it seems, indeed, not to be the right one for our purposes." It is also worth stressing that the "role model" for neo-classical economists already changed its "course": "By the time Jevons and Walras began laying the cornerstones of modern economics, a spectacular revolution in physics had already brought down the mechanistic dogma both in the natural sciences and philosophy. And the curious fact is that none of the architects of 'the mechanics of utility and self interest' and none even of the latter-day model-builders seem to have been aware at any time of this downfall." (Georgescu-Roegen, 1971, pp.2-3, cited in Clark and Juma, 1988, p.207)

⁵⁶ Lawson (2013, p.948) offers an overview of these claims, including a particularly vivid one by Schumpeter: "there is no more sense in calling the Jevons-Menger-Walras theory neoclassic than there would be calling the Einstein theory neo-Newtonian". One could add, though, that Einstein's theory seems to be much more relevant in explaining phenomena in physics than neo-classical economics in analysing economic developments.

diversity even inside this 'camp', however.⁵⁷ For instance, the equilibrium states are quintessential for some authors, while for others are not. Moreover, there is some disagreement whether equilibria are supposed to always prevail axiomatically, or only their possible existence is among the main research questions. Just to mention a few attempts, the neo-classical school has been defined in the following ways (all cited by Lawson, 2013, p. 949):

“(1) an individualistic perspective, a requirement that explanations be couched solely in terms of individuals; (2) an acceptance of some rationality axiom; and (3) a commitment to the study of equilibrium states.” (Hahn, 1984)

“1. People have rational preferences among outcomes. 2. Individuals maximize utility and firms maximize profits. 3. People act independently on the basis of full and relevant information. Theories based on, or guided by, these assumptions are neoclassical theories (Weintraub, 2002).”

Neo-classical economics “(1) assumes rational, maximizing behaviour by agents with given and stable preference functions, (2) focuses on attained, or movements towards, equilibrium states, and (3) is marked by an absence of chronic information problems (Hodgson, 1999, p. 29).”

From the point of analysing innovations, the following neo-classical assumptions are essential: homogenous products, diminishing returns to scale, technologies accessible to all producers at zero cost, perfectly informed economic agents, perfect competition, and thus zero profit. In this framework, technological changes were treated as exogenous to the economic system. Thus, uncertainties were not considered, either; the underlying notion related to innovation was risk, assuming that the probability distribution of all possible events can be known *a priori*. The major actor in these models is the ‘representative agent’, that is, a single person who – regardless of his or her field of activity – has no specific characteristics. In brief, innovation became a non-issue in neo-classical economics.

Building upon the neo-classical framework, Nelson (1959) and Arrow (1962) started a systematic analysis of firms’ in-house R&D activities. In this way, a certain type of technological innovations, that is, the ones based on intramural R&D results could be considered.⁵⁸ It is an important ‘class’ of innovations, no doubt, but at least equally important ones were disregarded. These include: (a) innovations based on the results of extramural R&D projects conducted in the same or other sectors, at public or private research establishments, home or abroad; (b) all other technological innovations based on non-R&D type of knowledge, e.g. stemming from various other sources, such as design, scaling up, testing, tooling-up, trouble-shooting, and other engineering activities, ideas from suppliers and users, inventors’ concepts and practical experiments, as well as collaboration among engineers, designers, artists, and other creative ‘geeks’;⁵⁹ and (c) non-technological innovations, such as organisational, managerial, marketing, or

⁵⁷ A further issue, namely the confusion between neo-classical and mainstream economics is not discussed here.

⁵⁸ The first models of innovation, developed by practitioners – policy-makers or managers of in-house R&D units of large firms – and natural scientists also regarded R&D as the principal information source of innovations. These are the so-called science-push models of innovations. To describe their origin and features in detail, as well as subsequent linear and non-linear models of innovations is beyond the scope of this contribution.

⁵⁹ Further, innovative firms also utilise knowledge embodied in advanced materials, other inputs, equipment, and software.

financial ones, as well as new business models.⁶⁰ Non-technological innovations are all the more important; as innovation studies have shown technological innovations can hardly be introduced without organisational and managerial innovations.⁶¹ Moreover, to latter ones – together with marketing innovations – are vital for the success of the former ones.

The pioneering work by Nelson and Arrow first looked as a promising extension of neo-classical economics, e.g. leading to economics of information, but in light of Nelson's later major contributions, can also be seen as the first step opening up fundamentally new avenues, namely evolutionary and institutional economics of innovation.

4.4. Social innovation and the assumptions of neo-classical economics

Social innovation is defined by the CRESSI project as follows: The development and delivery of new ideas (products, services, models, markets, processes) at different socio-structural levels that intentionally seek to improve human capabilities, social relations, and the processes in which these solutions are carried out.

Clearly, the theoretical framework of neo-classical economics cannot accommodate social innovations for several reasons. Just to highlight some of the most important ones, for social innovators the major goal is not optimisation in a strict economic sense. Second, social innovators do face uncertainty, too, not only calculable risks. Third, dynamic aspects are crucial, e.g. changes in the environment, in which social innovations take place; moreover, to induce this change is indeed among the major goals of social innovation. Fourth, various types of changes – economic, technological, organisational, social (e.g. structural, behavioural) and political – are endogenous from the point of view of social innovations, and co-evolve. Policy governance sub-systems and the level of governance need to be considered, too. In other words, these changes and co-evolutionary processes cannot be treated as exogenous. Fifth, social innovators are neither 'representative agents', nor do they act on their own. They have their own specific features, partly shaped by the context, in which they operate, and they need to interact with several other actors, and often form formal or informal networks to do so.

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⁶⁰ More recently, non-technological innovations often rely on technological elements or building blocks, too, e.g. on information and communication technologies (both hardware and software).

⁶¹ As already stressed, not all technological innovations are based on R&D results. Certain organisational, managerial, marketing and financial innovations, in turn, draw on R&D results (but usually not stemming from R&D activities conducted or financed by firms). For these two reasons it would be a mistake to equate technological innovations with R&D based innovations.

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