ASSA 2020 – San Diego, CA
3-5 January 2020

Association for Evolutionary Economics (AFEE)

The State as Innovator of First Resort: A New Approach to National Systems of Innovation

Giovanna Vertova[1]

Abstract

This paper has three aims. On the one hand I address the evolutionary literature about National Systems of Innovation (NSI), in order to show some theoretical problems about the State and its existence within a national system of innovation. By looking at the pioneering works of Chris Freeman, Bent-Åke Lundvall, and Richard Nelson I underline some shortcoming related to the definition of a NSI, the presence of the State within a NSI and its role. By reviewing the more recent literature about the NSI a conclusion can be drawn: an explicit role of the State has been quite neglected, despite the fact that the NSI theoretical tool has been widely used for policy considerations and suggestions. In line with the argument—or rather, the current propaganda—of "less State and more market," an active role of the State (and other public agents) as directly involved in innovation and technological change is missing.

The second point challenges the prescriptive tradition about the role of the State within a NSI. The State comes, indirectly, into an NSI only as an "institution" whose task is to supply the key elements for creating and maintaining a favorable environment for firms' innovative activities. The State must only supply and adjust the "proper" physical and social infrastructures, in order to enhance firms' ability to innovate. Thus, government policy toward innovation is relegated to a regulative task, leaving private capitalist firms to deal with innovations. The State must create and maintain competitive market structures in order to let firms compete among themselves, so that the most innovative will survive. The latest and more recent literature about "Schumpeter-meets-Keynes" kind of model assesses a different, but yet indirect, role of the State.

The last point is to introduce my approach to the role of the State towards innovation and research activities: State must intervene directly in some innovative activities and research, thus becoming an "innovator of first resort." In order to do just that, a clear distinction about the market-driven innovations of private firms vs. social-driven innovations by the State (or other public agents) is needed. The point here is not for the State to just create public knowledge that private firms can use. The point is that the State should first carry out innovations directly (than means creating new knowledge and applying it to production processes in a completely public value chain), and second, address these innovative activities toward more basic social needs, which may be better off in public hands than in free market competition. The State has to become an "innovator of first resort": the innovative State should do something different from what private firms do, having in mind some primary social needs.

[1] Department of Business, Economics and Quantitative Management, University of Bergamo (Italy). E-mail: giovanna.vertova@unibg.it

1. Introduction

Innovation and technological change have always been considered engines of growth. Moreover, before the Great Recession broke, during the last decades of increasing international competitions, innovations were considered as the most important source for firms' worldwide competitiveness. Nevertheless, ever since the development of the evolutionary (or neo-Schumpeterian) theory, a growing awareness was related to the fact that firms do not operate on an isolated island (not even for their innovative activities) but, instead, do work in environments which can either boost or harm their ability to innovate. Today, the National Systems of Innovation (NSI) approach is the main theoretical tool attempting to take into account the importance of the economic environment for firms' possibility to innovate. The NSI can account for two important and interrelated issues. On the one side, it is used to show international differences or similarities in countries' ability to innovate. On the other side, it becomes a normative tool used to give policy suggestions in order to support firms' innovative activities.

In spite of the growing literature on the NSI, this paper has a twofold aim. It starts by identifying some flaws, both in the theoretical and empirical literature. The critique concentrates, mainly, on the role of the State, by suggesting its neglect, despite the fact that this theoretical tool has been widely used for policy considerations and suggestions. Following the neoliberal argument of 'less State and more market', an *active* and *explicit* role of the State (and other public agents) as directly involved in innovation and technological change is missing. Consequently, the paper proposes to integrate the NSI with a more active role of the State, as far as innovative activities are concerned. Especially now, after almost 11 years of the outbreak of the Great Recession, it becomes impellent to look at the State as an *innovator of first resort*, with its direct involvement in specific sectors, strategic for the human well-being.

This paper is divided as follows. The next section speaks about the origins of the NSI concept, steaming from the evolutionary tradition. Section 3 concentrates on the role of the State within the NSI, by looking at the way it has been portrayed in the literature. Section 4 proposes a more direct role of the State as far as innovative activities are concerned: the State as innovator of last resort. Section 5 concludes.

2. The origins: from the evolutionary tradition to NSI

Ever since Rosenberg (1976), the evolutionary approach rejected some orthodox economic tools: the production function, the hypothesis of perfect rationality and complete information, and the idea of technology as a 'freely available black box' costly to produce but not to transfer. In 1982 the publication of *An Evolutionary Theory of Economic Change* by Nelson and Winter laid the groundwork for a new theory of the firm and for a new vision about innovation. Firms are not profit-maximising economic actors which can freely choose over a well-defined and exogenously given sets of choice. They are, instead, economic agents dealing with an uncertain environment, especially as far as innovation is concerned. Nelson and Winter developed a dynamic theory, which takes into consideration random elements, such as uncertainty, imperfect learning, going astray, and discovery. Within this kind of environment, firms learn through imperfect adaptation and mistake-ridden discovery, and follow routines, which can be inherited (tomorrow's actions are generated by today's), they are selectable (certain routines perform better than others), and are persistent (they can last for long periods).

Moreover, orthodoxy was also unable to deal with uncertainty. Following Schumpeter's (1912) tradition, innovation consists of any of the following: i) introduction of a *new* good; ii) introduction of a *new* method of production; iii) opening a *new* market; iv) conquest of a *new* source of supply of raw materials or half-manufactured goods; v) implementation of a *new* form of organization. Novelty is the key point, here. Innovation, therefore, means to look for 'something new' without knowing if this 'new' will ever be achieved, will ever be sold, will ever be profitable. Uncertainty is, therefore, a key feature of the innovative process. Moreover, novelty streams from new knowledge, thus making innovation the result of learning process. Only when new knowledge is created, innovation can then flourish. Knowledge has a twofold dimension: a 'public' one, taking the shape of information easily codified in patents, blueprints, textbook, etc.; and a 'tacit' one, embodied in routines, skills, competencies, specific practices (Nelson and Winter, 1982, chapter 4; Polanyi 1967). While the public aspect is costly to create but costless to transfer or to make available to others once it has been created; the tacit one is not so easily transferred, being the result of different learning processes. So, due to this tacit element, innovation is partially context-specific and localised, thus calling for a geographical dimension. When the geographical distance is negligible, and the institutional set-up coherent, those the tacit aspects are easier to transfer. Thus, an interaction between space and innovation occurs, with the development of concepts such as national, regional, and local system of innovation.

The NSI theoretical approach had its origins by the end of the 1980s and middle of the 1990s (Freeman 1987, 1988; Lundvall 1988, 1992a; Nelson 1988, 1992, 1993; Pelikan 1988). The collaboration between Chris Freeman, Richard Nelson and Bent-Åke Lundvall in the International Federation of Institutes for Advanced Study (IFIAS) project was then crucial. Despite some references to Friderick List's work (Freeman, 1995), three pioneering books set the 'standard': *Technology Policy and Economic Performance. Lessons from Japan* by Freeman (1987); *National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning* by Lundvall (1992a); and *National Innovation Systems. A Comparative Analysis* by Nelson (1993). By looking at these authors' definitions, some aspects strike (Table 1).

[Table 1 about here]

First of all, they all share an institutional dimension. Freeman (1987, p. 1) speaks about "The network of institutions…"; Lundvall (1992, p. 12) about "… the institutional set-up…"; and Nelson (1993, p. 4-5) of "… a set of institutional actors…". It is, therefore, a consolidated belief that the NSI is embedded in institutions. Yet, drawing from the 'old' and 'new' institutional economics (Hodgson 1998), the evolutionary tradition uses a very broad concept of institutions, leading to a concept of institutions encompassing almost every social aspects of life, such as habits, rules, customs, traditions, social conventions and norms. At this point the syllogism is easy: if every aspect of social life is an institution, and if the NSI is institutional based, then anything impacting on any aspect of social life will affect also the NSI. Yet, such a broad definition is rarely useful to identify the NSI key elements, their interactions and what affects them. Following this reasoning, the NSI concept becomes such a broad one that it can explain almost everything, and, therefore, nothing. If a theoretical concept is as such as to explain everything, its explanatory values is useless. Moreover, such broad definitions can foster the idea that all social, political, legal, cultural aspects of a nation must revolve around firms' ability to innovate. If the NSI's task is to foster private firms' ability to innovate, if the NSI is institutional base, and if institutions encompass almost everything, then every aspects of a nation must steer towards the innovative capabilities of private firms.

A second problem is the confusion between the descriptive and the normative dimension of the NSI. On the theoretical side, by looking at the three pioneering books, some insights can be drawn. Freeman has a definite normative approach, which can be captured by the subtitle of the book itself: *Lessons from Japan*. The author's task is clearly stated in the Introduction: 'This study is about some features of the Japanese system of innovation and their implications for other countries.' (Freeman 1987, p. 1). And, 'The book concentrates on the analysis of Japanese experience in the belief that comparative international studies can yield lessons of great importance for policy-makers, whether in the public or the private sector.' (Freeman 1987, p. 3). Despite some author's words of caution about his awareness that policies and institutions which appear to have worked well in one country cannot be mechanically transferred to another, some important social and institutional innovations can be widely and successfully diffuse to other countries, albeit with significance time lag. Lundvall has a more mixed approach. On the one side, the author claims that 'one of the main purpose of this book is to contribute to a theoretical understanding of interactive learning and innovation' (Lundvall 1992a, p. 4), thus leading to a descriptive dimension. On the other side, the author carries on by stating that 'the concept 'national system of innovation' may also be useful when it comes to inspire public policy at the national and international level' (Lundvall 1992a, p. 4), thus leading to a normative dimension. Nelson has a more definitive descriptive dimension. In a previous article summarizing the main context of his book, Nelson (1992, p. 347) states that 'The studies were carefully designed, developed, and written to illuminate the institutions and mechanisms supporting technical innovation in the various countries, the similarities and differences across countries and how these came to be, and to permit at least preliminary discussion of how the differences seemed to matter.

Empirical studies have been growing and expanding (Balzat and Hanusch 2004), sharing the same methodological approach: the key elements of a NSI must be identified and, when possible, measured. This literature agreed that the most important elements of any NSI are the following: innovative firms; public and private institutions conducing and supporting research and promoting the diffusion of knowledge and innovation; the system of education and training of the labour force; the financial system. For each of these components, statistical data are collected and used as proxies to measure all NSI elements, thus allowing international comparisons, leading to the search of 'the best' NSI to be used as a benchmark for other countries (Patel and Pavitt 1994). So, the theoretical tool becomes a normative one, with strong policy suggestions, immediately adopted by policy-makers (OECD 1988, 1997).

3. The missing role of the State

As just seen, the NSI literature, especially the studies with a descriptive approach, share the attempts to identify, and consequently, where possible, measure what are believed the most important NSI elements. Taking for granted that innovative firms are the core actors, other agents, organizations and institutions are crucial for firms' innovative ability. Again, going back to the three pioneering books, the key elements are clearly identified. By looking at the Japanese system, Freeman (1987, p. 4) decides to focus his attention on some specific aspects: 'The analysis concentrates on four main features of the system: 1. the role of the Ministry of International Trade and Industry (MITI), 2. the role of company research and development strategy in relation to imported technology and 'reverse engineering', 3. the role of education and training and related social innovations, and 4. The conglomerate structure of industry'. Lundvall (1992a, p. 13) lists the elements of the systems, such as: 'international organization of firms, interfirm relationship, role of public sector, institutional set-up of the financial sector,

R&D intensity and R&D organization'. Nelson (1992, 1993) identifies the following major institutional actors: firms and industrial research laboratories, universities and government laboratories; government financial support for R&D in industry; the national system of schooling and training; financial institutions. By putting together these approaches with the more recent literature (Groenewegen and van der Steen 2006; Shafir 2006), it is possible to state that a typical idealize NSI is formed by the innovative firms, the core of the system, interacting among themselves and also with others (clients and suppliers) through user-producer relationships (Lundvall 1992b). Furthermore, firms interact also with non-market agents, such as the external environment encompassing organizations and institutions. First of all, firms interrelate with institutions and organizations – such as universities, technological institutions and public research laboratories – involving in the generation and development of basic scientific research as well as the training of scientists and engineers. Secondly, firms depend upon national education systems and labour markets, because schooling, training and retraining not only determine the supply of skills of the labour force but also influences the attitudes of workers towards technical change. Thirdly, firms need a proper institutional set-up, encouraging them to innovate. Competition in markets as well as intellectual property right (in a broad sense) must be guaranteed. Least but not last, the financial system must be geared towards the best way to finance innovative activities, which are uncertain and costly.

Although all the previous definitions share an institutional approach, where institutions are key elements of the NSI, the State is never clearly mentioned. States and governments do not appear as explicit elements of NSI. Nevertheless, some of its policies do, although in a very underlying manner. Fiscal policies are implicitly suggested by the normative approach, when policy suggestions recommend the creation and support of a 'friendly' environment in order to foster firms' ability to innovate. Therefore, universities, technological institutions and public research laboratories must interact with firms in order to support and help them to innovate. Universities play an extremely important role in technical advance and knowledge creation, not only as places where industrial scientist and engineers are trained, but also as the source of research findings and techniques considered to be relevant to innovation in industries (Industry and Innovation 2006). Moreover, national education systems must be geared to the needs of firms' innovative activities, by creating skilled labour force at all level of education. A more educated and trained labour force can develop new technological useful knowledge through various kinds of learning processes. Furthermore, the State must intervene as a regulator in order to guarantee the existence of proper market competition and the possibility for innovative firms to appropriate the results of their R&D activities (with, for example, the legal protection of intellectual property rights). Most of these government interventions are part of the fiscal policy, because they are possible only with public expenditures. Nevertheless, fiscal policies are never explicitly mentioned in the analysis, although they are indirectly called for in relation to the creation of physical and social infrastructures needed by innovative firms.

Also the monetary policy is generally quite overlooked, being hardly mentioned as a NSI element. The problematic issue of financing innovation has been acknowledged later in the evolutionary tradition. It seems surprising that a tradition steaming from Schumpeter initially overlooked the matter. Schumpeter was the first to draw a strong connection between innovations and the credit system, with the banker being the '*capitalist par excellence*', stressing that 'credit is primarily necessary to new combinations' (Schumpeter 1912). Schumpeter's essential point is that new combinations (i.e. innovations) in production and in products could not appear without being financed. Therefore, finance and development are in a symbiotic relationship. Moreover, according to the Austrian economist, money is never neutral and the credit mechanism, managed by bankers and financiers, is necessary to development.

The banking (and the financial system) create the 'purchasing power' enabling firms to carry out innovative activities, and, moreover, they choose which innovative projects deserve to be financed. Therefore, if and how innovations are financed depends, also, on the monetary policy, which, in turn, affects the banking and financial system of a nation.

The evolutionary tradition literature focuses on a theoretical description of financial system, in order to understand its effects on firms' innovative performance (Dosi 1990; Tylecote 1994). Two stylized financial systems were distinguished: the 'bank-based' (or 'credit-based') and the 'stock-exchange based' (or 'market-based'). The former is where firms use banks as their main source of external funding: each loan is seen as part of a long-term relationship where, on the one side, the firm is willing to give the bank full information about its performance and plans; and, on the other side, the bank is committed to support the firm even through bed times. The latter is formed by quoted firms which look at the Stock Market as a major source of financing. So, the national financial system becomes a NSI crucial element. National financial systems impact on the borrower-lender relationships, characterized by asymmetric information and uncertainty which can be reduced by the type of relationships between the borrower (in this case, firms) and the lender (in this case, banks and financial institutions). Different credit channels create distinctive relationships, which may or may not reduce uncertainty, and, consequently, may foster or harm innovations.

The financial system is analysed as a sum of different financial instruments, with the aim to find which is the 'right' one for different types of innovations. So, for example, using the previous distinction, it is shown that, the bank-based system is better for long-term investment and innovations while the stock-exchange based is better for highly costly and risky innovations (Tylecote 1994). Also in this case, the descriptive analysis translates immediately into a normative tool. The OECD (2012, p. 161) states that "Promoting investment in innovation through greater access to finance remains an issue across the OECD. The problem is how to increase and broaden the sources of public and private financing for innovation, […]". The empirical literature shows that each financial instruments has varying impact on different kinds of innovations (Brown, Fazzari and Petersen 2009; Gompers 2002; Hsu, Tian, Xu 2014). Bank loans tend to be the most common tool for access to finance, though they require collateral and/or guarantees. Grants and subsidies are mostly used by start-up and SMEs at the seed and early stage. Business angels provide financing at early riskier stage. Venture capital tends to invest later, at less risky growth stage. Corporate venturing is generally used by large firms to invest in innovative start-ups. Crowd funding makes it easier for SMEs to raise capital at the seed and early stage, because it is a tool based on Internet. Finally, tax incentives are used by most governments.

This approach as some flows. It is a 'micro' approach, which attempts to find the better financial instruments for innovations, according to the characteristics of firms (large, small, product specialization and sectors, age, etc.). This way of looking at the relationship between finance and innovations prevents to see the 'macro' aspect of finance, such as the financialization of the economy. Also thanks to direct interventions of State and governments (the case of the repeal of the *Glass-Steagall Act* is an example), financial innovations were invented in order to enable firms (all firms) to make profits through financial markets, rather than through production and innovations. Many heterodox economist underlying that financialization emerged as a response to firms' problems in making profits (Arrighi 2010; Brenner 2002; Harvey 2010). The lack of profitable investment opportunities in the real sector led to the searching for higher profits in the financial one. This strategy had a strong impact on innovations, because more and more firms re-directed their resources towards financial

markets, instead of towards production, investment and innovation. Lazonick and O'Sullivan (2002) remark that, in 1998, Intel spent more than twice as much on stock repurchases than on R&D; and Microsoft's stock repurchases were almost equal to its in-house spending on R&D. Moreover, finacialization changes the corporate governance of firms, leading to what Minsky called 'money manager capitalism' (Minsky 1998). Maximizing shareholder value become the new mantra and led to shareholder pressure, short-termism, downsizing and the allocation of more resource to financial investments, with their negative impacts to innovations.

So, the State never comes into the NSI directly, with its two most powerful instruments, the fiscal and the monetary policy. Nevertheless, it is present indirectly, when speaking about industrial policy, innovation policy, technology policy: the State is an 'institution' whose task is to supply the key elements for creating and maintain a favourable environment for firms' innovative activities. The State must *only* supply and adjust the 'proper' physical and social infrastructures, in order to enhance firms' ability to innovate, and/or it must create and maintain competitive market structures in order to let firms compete among themselves, so that the most innovative will survive. Thus, government policy towards innovation is relegated to a regulative task, leaving private capitalist firms to deal with innovations.

This normative dimension of the State in the NSI has three main flaws. Firstly, the regulatory task is relegated to the microeconomic environment (i.e. industrial, innovation and technology policy, and the supply of physical and social infrastructures, etc.). It seems that the macroeconomic dimension, also shaped by government policy, is not take into proper consideration. Secondly, due to this strong supply orientation, some of its elements are geared towards firms' innovative activities, although they should have very different social tasks. An example above all relates to Universities. Most literature stresses the point the Universities must interact with firms, in order either to create new knowledge that firms can use or to interact with them to develop and implement innovation, or must act as private firm thus becoming academic entrepreneurs (Economics of Innovation and New Technology, 2012). Nevertheless, Universities should have a different social task: offer higher education to the population, in order to create well-educated citizens. Finally, the normative dimension with its supply-side orientation finds a strong theoretical background in mainstream economics, brought back to the top in the last decades. Monetarism and supply-side economics put back at the top the faith in self-regulating markets, with the idea that private capitalist firms are the only economic agents able to create wealth, growth and employment (the so-called 'trickle down effects'). The normative dimension is based on the same assumption: private capitalist firms are considered to be the best and only agents of innovative activities. The quantity and the quality of private firms' innovations are never questioned, because it is implicitly assumed that they are beneficial, neglecting any kind of considerations for harmful innovations and/or negative externalities (i.e. pollution). Moreover, it is never explicitly mentioned that innovative activities of private capitalist firms are driven by profits expectations, which can be pursued regardless of the social consequences (i.e. army industry, genetically modified foods, ect.).

4. The State as innovator of first resort

Many heterodox economists speak about a new phase of capitalist development, which started by the late 1970s, and called it *neoliberalism* (Saad-Filho and Johnston 2005, Duménil and Lévy 2011). This new model of capital accumulation was created not only by market forces, but also supported by new political and theoretical ideas. The Chicago School of Economics supplied the economic theory, which was a revisited edition of the 'old' neoclassic one. Emphases on the efficiency of market competition, the role of individuals in determining

economic outcomes, the distortions associated with government intervention and regulation of markets were the main tenets, diffused worldwide by the so-called *Chicago Boys*. The main characteristics of neoliberalism are: "a new discipline of labour and management to the benefit of lenders and shareholders; the diminished intervention of the state concerning development and welfare; the dramatic growth of financial institutions; the implementation of new relationship between financial and non-financial sectors, to the benefit of the former; a new legal stand in favour of merges and acquisitions; the strengthening of central banks and the targeting of their activity towards price stability, and the new determination to drain resources of the periphery towards the centre (Duménil and Lévy 2005, p. 10). Within this political and theoretical background, the State has a very narrow room to operate. Industrial and innovation policies are reduced to performing a regulative task, in order to create a proper 'friendly' environment where private capitalist firms can prosper and innovate. Yet, Mazzucato (2013) has clearly shown that, the dogma of 'less State and more market' has not been occurred in realty. By looking as some most innovative US industries of the last decades, the author shows how the State has been a riskier entrepreneur than private firms, as well as how private firms have heavily relied upon State support. Moreover, the author shows how even more innovative firms have free-ride in what she called a parasitic system: a system where the private sector is able to take advantages from the State, without paying for it. So, in reality, in most cases, the State has played the role of a leading investor, going beyond market and system failures, without reaping the benefits.

Mazzucato's (2013) work is very valuable, because it clearly demolishes the myth of the efficient private firms vs. the inefficient public ones. Yet, a step further must be taken. A new way to look at innovations and at the State involvement is necessary, especially in this period of crisis. In order to do that, some qualifications are needed. The first one is related to the heated debate about 'private' *versus* 'public'. The dispute of 'private vs. public' is pointless if it is taken into consideration that these two types of economic agents have different tasks and goals. Private firms produce and innovate in order to make profits. Being their actions driven by profit expectations, they can, and most of the time do, neglect the social consequences of their decisions. The State should have some social goals in mind and should not be influenced by profits expectation but by some higher social considerations. So, according to me, a more interested discussion should be about *market-driven innovations* of private firms vs. *social-driven innovations* of the State (or other public agents). The point here is not for the State to just create public knowledge that private firms can use. The point is that the State should carry out innovations directly (than means creating new knowledge and applying to production processes in a completely public value chain), and address these innovative activities towards more basic social needs, which are be better off away from the market. In so doing, and paraphrasing Keynes, the State should become an *innovator of first resort*: the innovative State should do something different from what private firms do, in order to fulfil some primary social needs unmet by private firms.

Some examples can clarify the point. The most basic need for human being is the possibility to have healthy nourishment on the table every day. A quick look at today's agricultural industry shows how and to what extent it has become a real business (it is not by chance that the sector's name has been changed into agro-business), managed by large-scale, industrialized, vertically-integrated firms. Innovation in this sector are not always harmless, as genetically modified food shows. A second important need is to live a healthy life and, in order to do so, a healthcare system is a necessary, although not sufficient, dimension. Drugs and medicines must be there as well. Mazzucato (2013) show that, the US pharmaceutical industry is a typical case of free-riding: State-funded laboratories have invested in the riskier phase of the innovative process,

producing the most radical new drugs; while the big private pharmaceutical companies have preferred to invest in less risky activities, developing variations of existing drugs. Finally, today one of the most worrying concern is climate change. In this case, green technologies and the green revolution are called to mind. Nevertheless, the Green New Deal will not happen only through taxes (on polluting productions) and incentives (for green technologies). These examples question whether it is sensible to leave the State just to regulate these sectors, or to call for a direct and stronger State presence.

By taking a Keynesian approach, a State as innovator of first resort can also help to exit the current crisis, by creating public jobs for producing and supplying social public goods. Many economist has stressed the importance of an expansionary fiscal policy as the only way out from the crisis. Combing the two could give a desirable outcome of reducing unemployment and creating a more sustainable growth.

6. Conclusions

This paper aims to explain some flaws about the theoretical approach of evolutionary thinking regarding the State and its role within the NSI. It seems that both the descriptive and the normative dimension of the NSI and of the role played by the State give suggestions for public policy which are in line with the supply-side economics. Within this framework, the State has no active and direct role to play as far as industrial and innovation policy are concerned; but it is simply relegated to either reduce market failures or control negative externalities. This argument is in line with the usual one about the efficiency of private firms vs. the inefficiency of any kinds of public agents. Needless to say there is much ideology and myth about the economic superiority of private firms, as Mazzucato (2013) has clearly pointed out. Moreover, it should not be the right time to declare the supremacy of private firms, since the current economic crisis is the result of private economic actors.

The point is that the opposition between the private (efficient firms) and public (inefficient actors) is misplaced: they are different kinds of economic agents, who should have different tasks and goals in mind. And this applies to the creation, diffusion and utilization of new knowledge for technical progress and innovations. So, a more transparent distinction should be between *market-driven innovations*, carried out by private capitalist firms, and *social-driven ones*, performed by public economic agents. Therefore, the question is not about the capacity (or incapacity) of the State to pick winners, but the ability of the State to have some social priorities, democratically chosen by a bottom-up approach, and to work on them. The creation, diffusion and utilization of knowledge to industrial processes should have some social needs in mind and should be separated from markets and profits expectations. A Keynesian State, working as innovator of first resort, has more chance to use knowledge and innovation for some crucial social goals. Least but not last, this kind of approach to industrial and innovation policy has more possibility to lead us out of the current crisis.

References

Arrighi G. (2010), *The Long Twentieth Century: Money, Power, and the Origins of Our Times*. London: Verso.

Balzat M. and Hanusch H. (2004), "Recent trends in the research on national innovation systems", *Journal of Evolutionary Economics*, 14(2): 197-210.

Brenner R. (2002), *The Boom and the Bubble: the U.S. in the World Economy*, New York: Verso.

Brown J.R., Fazzari S.M. and Petersen B.C. (2009), "Financing innovation and growth: cash flow, external equity, and the 1990s R&D boom", *Journal of Finance*, 64(1): 151-85.

Dosi G. (1990), "Finance, innovation and industrial change', *Journal of Economic Behaviour and Organisation*, 13(3): 299-319.

Duménil G. and Lévy D. (2005), "The neoliberal (counter)revolution", in A. Saad-Filho and D. Johnston (eds.), *Neoliberalism. A Critical Reader*. London and Ann Arbor (MI): Pluto Press (pp. 9-19).

Duménil G. and Lévy D. (2011), *The Crisis of Neoliberalism*, Cambridge (MA) and London: Harvard University Press.

Freeman C. (1987), *Technology Policy and Economic Performance: Lesson from Japan*. Pinter Publisher.

Freeman C. (1988), "Japan: a new national system of innovation?", in G. Dosi, C. Freeman, R. Nelson, G. Silverberg, L. Soete (eds.), *Technical Change and Economic Theory*. London and New York: Pinter Publisher (pp. 330-348).

Freeman C. (1995), "The 'National System of Innovation' in historical perspective", *Cambridge Journal of Economics*, 19(1): 5-24.

Gompers P.A. (2002), "Corporations and the financing of innovations: The corporate venturing experience", *Federal Reserve Bank of Atlanta Economic Review*, 87(4): 1-17.

Groenewegen J. and van der Steen M. (2006), "The evolution of National Innovation Systems", *Journal of Economic Issues*, 40(2): 277-285.

Harvey D. (2010), *The Enigma of Capital and the Crisis of Capitalism*, New York and Oxford: Oxford University Press.

Hodgson G. M. (1998), "The approach of institutional economics", *Journal of Economic Literature*, 36(1): 166-192.

Hsu, P-H., Tian X., Xu Y. (2014), "Financial Development and Innovation: Cross-Country Evidence", *Journal of Financial Economics*, 112(1): 116-135.

Industry and Innovation (2006), *University Technology Transfer and National Systems of Innovation*, Special issue, 13(4).

Lazonick W. and O'Sullivan M. (2000), "Maximizing shareholder value: a new ideology for corporate governance", *Economy and Society*, 29(1): 13-35.

Lundvall B-Å. (1988), “Innovation as an interactive process: from user-producer interaction to the national system of innovation”, in G. Dosi, C. Freeman, R. Nelson, G. Silverberg, L. Soete (eds.), *Technical Change and Economic Theory*. London and New York: Pinter Publisher (pp. 349-369).

Lundvall B-Å. (1992a, ed.), *National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning*. Pinter Publisher.

Mazzucato M. (2013), *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, London: Anthem Press.

Minsky H.P. (1998), *Schumpeter: Finance and Evolution*, Hyman P. Minsky Archive, Paper 314.

Nelson R. (1988), “Institutions supporting technical change in the United States”, in G. Dosi, C. Freeman, R. Nelson, G. Silverberg, L. Soete (eds.), *Technical Change and Economic Theory*. London and New York: Pinter Publisher (pp. 312-329).

Nelson R. (1992), “National innovation systems: a retrospective on a study”, *Industrial and Corporate Change*, 1(2): 347-374.

Nelson R. (1993, ed.), *National Innovation Systems: a Comparative Analysis*. Oxford University Press.

Nelson R. and Winter S. (1982), *An Evolutionary Theory of Economic Change*. Cambridge Mass.: Harvard University Press.

OECD (1988), *New Technologies in the 1990s*, Paris.

OECD (1997), *National Innovation Systems*, Paris.

Patel P. and Pavitt K. (1994), “National Innovation Systems: why they are important, and how they might be measured and compared”, *Economics of Innovation and New Technology*, 3(1): 77-95.

Pelikan P. (1988), “Can the imperfect innovation systems of capitalism be outperformed?”, in G. Dosi, C. Freeman, R. Nelson, G. Silverberg, L. Soete (eds.), *Technical Change and Economic Theory*. London and New York: Pinter Publisher (pp 370-398).

Polanyi M. (1967), *The Tacit Dimension*, London: Routledge & Kegan Paul.

Rosenberg N. (1976), *Perspectives on Technology*. Cambridge: Cambridge University Press.

Saad-Filho A. and Johnston D. (2005, eds.), *Neoliberalism. A Critical Reader*. London and Ann Arbor (MI): Pluto Press.

Schumpeter J.A. (1912), *The Theory of Economic Development*, Cambridge, MA: Harvard University Press.

Shafir N. (2006), “Emergence and development of the National Innovation Systems concept”, *Research Policy*, 35(5): 745-766.

Tylecote A. (1994), “Financial systems and innovation”, in M. Dodson and R. Rothwell (eds.), *The Handbook of Industrial Innovation*, Elgar (pp. 259-267).

Table 1. Some NSI definitions

Freeman (1987, p. 1)	Over the last two centuries those scientific and technical activities which are intended to promote the flow of technical and organizational innovations and their diffusion have vastly increased in scale and have become highly specialised in a variety of institutions. At the same time national education and training systems, which may both encourage and disseminate advances in technology, have expanded largely to ensure that the labour force has the changing mix of skills needed to diffuse and operate these new techniques efficiently. The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies may be described as 'the national system of innovation'.
Lundvall (1992, p. 12)	The narrow definition would include organisations and institutions involved in searching and exploring – such as R&D departments, technological institute and universities. The broad definition […] includes all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring.
Nelson (1993, p. 4-5)	There is, first, the concept of a national system of innovation itself. […] Consider the term "innovation". In this study we interpret the term rather broadly, to encompass the process by which firms master and get into practice product designs and manufacturing processes that are new to them, if not to the universe of even to the nation. […] Then there is the term "system". […] Rather the concept is of a set of institutions whose interaction determine the innovative performance, in the sense above, of national firms. […] Rather, the "system" concept is that of a set of institutional actors that, together, plays the major role in influencing innovative performance.