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Is 'Open Innovation' Re-Inventing Innovation Policy for Catching-up Economies?

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Abstract. This paper discusses the current state of the 'open innovation' thinking in the context of core economic challenges faced by catching-up and developing countries. The main argument of the paper is that due to the paradoxes and contradictions between the 'mainstream' innovation discourse and practice and the peculiar challenges of the catching-up countries, applying the concept of 'open innovation' may have unintended or reverse effects on catching-up development. This problem can be remedied by more conscious attention to the basic contradictions and paradoxes that requires a more comprehensive analytical focus on innovation and technological development at the levels of firm, industry and policy.

Keywords: innovation; innovation policy; innovation theory; open innovation; development economics; development policy; evolutionary economics; catching-up countries; developing countries.

1. Introduction

In recent years, the discourse on innovation has witnessed the emergence of new, by some accounts even paradigmatic, conceptual views on the processes of innovation and the relationship between firms, industries and the wider socio-economic context. The concepts of 'open innovation', 'peer production', and 'social production' claim to offer fundamentally different views on the theories and processes of innovation and propose reconfigurations of current innovation practices, systems and policies.

One of the most prominent concepts seems to be that of 'open innovation' (Chesbrough, 2003; 2006; Chesbrough, Vanhaverbeke and West, 2008), which has also become one of the core components in the recent innovation and innovation policy discourse (e.g. OECD, 2009; OECD, 2008a; 2008b). 'Open innovation' in brief is *'the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for the use of innovation, respectively'* (Chesbrough, 2008a, p.1); and *'open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology'* (Chesbrough, 2003, p. xxiv). Therefore, this approach can be viewed mainly as a managerial approach – i.e. a combination of managerial principles and methods – that is largely based on the simple idea that *'valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well'* (Chesbrough, 2008a, p.1). The most comprehensive accounts on the topic (e.g., Chesbrough, 2003; 2006; Chesbrough, Vanhaverbeke and West, 2008) have been developed based mainly on the experience of leading US multinational firms, i.e. it is a conceptual approach based on empirical contextual observations and subsequent theorising.

In the paper we argue that this recent debate, especially that on open innovation, has so far lacked proper emphasis on the 'contextuality' of development and innovation. While this is certainly partially because of the relative infancy of the debate, on the other hand these concepts have emerged from the wider discourse and research on innovation in highly developed countries. Therefore, we argue that there has been a peculiarly de-contextualised convergence of innovation discourse that in consequence uses theories and concepts derived from the context of the core countries of current technological development and innovation.

As we will show below, this has also resulted in the prevalence of de-contextualised understanding of innovation and innovation policy in catching up countries (e.g. countries in Eastern Europe and Latin America). This understanding is more often than not off the target, and the new concepts such as open innovation are ill-fitted to the catching-up context. We show that utilising the emerging theoretical consensus between evolutionary and neo-classical theorists (that emphasises the targeting and development of organisational capabilities in the private sector through contextualised policy-making institutions and instruments) is the key for catching-up to be successful. Thus, instead of trying to outdo developed countries in 'new' ideas for innovation and innovation policy, catching up countries should in many ways go back to and start with development and innovation policy basics. The global recession has laid bare the enormously imbalanced development in many catching-up countries (from the Baltic States to Mexico) that is partially engendered by de-contextualised and ineffective innovation policies in these countries.

In other words, this article sets out to place the recent debate into the context of more peripheral, catching-up countries and to discuss the theoretical implications of open innovation on the catching-up processes.

2. The systemic understanding of innovation in catching-up countries?

The late 1990s and 2000s have witnessed a growing literature and research on innovation as the key to catching-up and development (OECD, 2009; Radosevic, 2009; UNIDO, 2009; World Bank, 2008a; 2008b; also Rodrik, 2007). The academic research has largely looked into three catching-up regions – Eastern Europe (EE), Latin America (LA) and East Asia (EA) – with the former two being considered as cases of relative failure¹ (e.g.

¹ The failure of EE and LA innovation and development policy is recognised at least in the academic debates, while the public and policy discourse has usually followed a perception that the development of the LA has been a failure and the development of EE more of a success story, see also Kattel, Reinert, Suurna (2009); Tiits et al. (2008);.

Cimoli, Ferraz and Primi, 2005; 2009; Kattel, Reinert and Suurna, 2009; Radosevic and Reid, 2006; Tiits et al., 2008; Török, 2007) and the latter as an almost unequivocal success story (e.g. Amsden, 2007; Chang, 2007; Wade, 2004) of policies aimed at sustainable economic and technological catching-up.

These differences and the failure of EE and LA are credited to the infusion of a specific 'Western' discourse on economic development and innovation to the respective discourse of these regions. This can be seen to have taken place from two perspectives, i.e. catching-up strategies of the EE and LA countries have been influenced by the interdependence of Washington Consensus (WC)-based economic policies and a Western-biased understanding of systems of innovation and conceptualisation of innovation. In this context the literature on EE (e.g. mainly by Radosevic, 1998; 2006; 2009; also Piech and Radosevic, 2006; Tiits et al., 2008) and LA (e.g. Cimoli, Ferraz and Primi, 2005; 2009; Cimoli and Katz, 2003; Sutz, 2000) seem to agree that the innovation policy in EE and LA has largely failed because of peculiar mistakes in the policy process: mainly because of misconceptions of the initial problems of catching-up and development. In the case of EE, the problem lies in the misinterpretation of the Soviet industrial R&D structure and capacities (resulting in 'primitivisation' of economic structure), in the case of LA in the misunderstanding of the potential effects of liberalisation and opening up (resulting in 'foreignisation' of economic structure). The latter has been shown to also be a similar error of innovation policy of EE countries throughout the 1990s as well. Both of these policy failures have led towards weakened capacities for economic restructuring and catching-up.

These policy failures of catching-up development have been largely caused by the mistiming of policy emulation (e.g. Reinert, 2007). At the beginning of the 1990s, the developed world itself was largely facing a huge challenge in having to rethink policies and models for economic growth and technological development (e.g. Sharif, 2006; Soete, 2007). At least part of it can be attributed to the techno-economic paradigm shift (see Perez, 2002) which brought about new policy challenges – e.g., modularity in production processes, outsourcing etc. – that changed the context of growth and development.² In depth discussions on the systems of innovation in developing countries are a more recent phenomenon (e.g. Lundvall et al., 2009).

² Further, Mowery (2009) has argued that the recent debate on innovation (i.e., changes of industrial R&D processes and strategies and the emergence of open innovation debates) is a historically recurrent process that in the late 19th and early 20th centuries revealed itself in traditional industries and in the late 20th and early 21st centuries in the new industries based on ICT, biotech etc. Therefore, it cannot be seen as a paradigmatic change, but rather as a path-dependent development that according to Mowery has also been heavily dependent on public policies.

Therefore the debate on innovation has moved towards an ever-increasing complexity of theories and models explaining innovation and economic growth/development; the academic discourse has moved from entrepreneurial and firm-level approaches to innovation (starting with Schumpeter, 1939) towards a more systemic view of the influence of the socio-economic environment, i.e. a systems-of-innovation approach (for overview, see Fagerberg, 2004). Thus, the discourse on innovation and economic development can be largely divided into two levels of analysis: *entrepreneur- or firm-level* processes of innovation *and socio-economic conditions* (and policies) supporting innovation. Concepts of clustering, agglomerations, linkages and others highlight the mutually reinforcing effects of these levels. Analytically, though, the different implications of these levels are of importance as the impacts of one on the other are, as the paper argues, contextual.

But, the system-level approaches to innovation are in essence a reflection of the long-term developments in developed/Western countries stemming from specific context and have followed rather distinct and recurring development patterns (e.g. Mowery, 2009; Soete, 2007). Thus, the system-level models include both implicit and explicit presumptions as the preconditions for the conceptual arguments to hold up; that is, these models presume that innovations take place at the firm level and are induced by entrepreneurship and related capabilities. The systems-of-innovation models in general concentrate on the external factors that are seen to reinforce these processes.

The recent more popular academic research since the 2000s has increasingly started to debate over the relevance of the past approaches (i.e. the movement from the linear to the systemic view of innovation) and understandings of innovation at the firm level (e.g. Chesbrough, 2003; 2006; Chesbrough, Vanhaverbeke and West, 2008; also Benkler, 2006). It is noteworthy that these new concepts, especially the concept of open innovation, are mainly firm-level discussions on innovation (e.g., about R&D processes, business models etc.).³ Therefore, the debate lacks strong and coherent research on the system-level implications of the new concepts and links with the previous research and policy discourse (with some excep-

³ The concept of open innovation in brief argues that in addition to the traditional modes of innovation relying on the firm-level capacities, the new modes of innovation that seek to benefit from the external capacities (and internally underutilised internal capacities by putting them on the market) are becoming an integral and equally important part of business and R&D strategies of companies. Thus, open innovation does not fully replace the old, but complements it with something new.

tions, see e.g. Dahlander and Gann, 2007; de Jong et al., 2008; Vanhaverbeke et al., 2008).⁴

Also, a recent 'stock-taking' on innovation policy development by OECD (Box, 2009, p. 2) summarises the development of the innovation policy discourse as follows:

The stocktaking highlights that much work, both theoretical and empirical, has already been done to identify the policies, institutions and framework conditions that can provide the most effective means of supporting innovation. However, evaluation of specific government support policies and their impacts on innovation is generally sparse and there is a need for more and better evidence on the costs and benefits of government support for innovation.

Further, the overview argues (p. 16) that the policy mixes to solve the challenges of innovation systems have to be mostly context-dependent because '*there are major national differences in comparative and competitive advantages, implying potentially different patterns of response to similar policy instruments*'.

We cannot witness any coherent research or theorising on how these fundamental changes in innovation discourse affect the catching-up perspectives and policy needs of lagging regions. Most of the above-made references to the empirical research on catching-up regions have placed some emphasis on the differences of policy needs and capacities between the catching-up regions and the original context from which most of the dominant policy discourse arises. The general policy-relevant claim is thus that a context-specific policy analysis is the key. This is also recognised in the most recent policy-level debates (OECD, 2009; UNIDO, 2009; also Box, 2009) and in the analysis of the implications of open innovation on national innovation policies (see, e.g. de Jong et al., 2008; Vanhaverbeke, 2008). Yet, the general tone of this claim at the policy level remains rather vague or abstract:

⁴ The open innovation concept has been linked (Chesbrough, Vanhaverbeke and West, 2008) to several levels of analysis: firm level; inter-firm level; level of institutional set-up. In the same line, Vanhaverbeke (2008) has offered a five-level distinction: intra-organisational networks; firm level; dyad level; inter-organisational networks; national/regional innovation systems. However, literature overview on open innovation by Fredberg, Elmquist and Ollila (2008) has argued that so far the topic of open innovation has mainly been analysed as a pure innovation issue and other related aspects and consequences of organising open innovation have not been included in the open innovation literature. Therefore the overview indicates that there are only few attempts to look at the industrial dynamics and beyond the firm level in discussing open innovation (see, e.g. Berkhout et al., 2006; Bromley, 2004; Christensen, Olesen and Kjaer, 2005; Cooke, 2005; Vanhaverbeke, 2008). Works by de Jong et al. (2008) and Vanhaverbeke et al. (2008) are the first comprehensive attempts to look at the public policies fostering open innovation. Yet, both of these accounts are sensitive to the need to have a further look into the developing country specificities.

... low income developing countries face greater difficulties in making innovation the engine of development. Not only are there objective barriers such as poor framework conditions, limited human and social capital for producing, disseminating and using knowledge, but there is also a low capacity in policy making regarding innovation. (OECD, 2009, p. 53)

The policy recommendations that follow this are rather generic and 'one-size-fits-all' and, as we will later argue based on different theoretical accounts, destined to fail or detrimental in the context of the perceived openness of innovation processes; e.g. the recommendations include '*focusing on innovations that are best suited for developing countries*' (meaning broader, localised forms of innovation, as opposed to attempting to foster high-tech innovations which require large public and private long-term investments and the fruits of which are not easily captured by local economies); '*forging technology transfer through trade and FDI; using public-private partnerships to help address missing market conditions and failures*' (OECD, 2009, pp. 53-54). Without due attention to the local capabilities, to past causes of underdevelopment, to the international developments, these kinds of policy recommendations may continue to result in de-contextualised policies and strategies.

In the following section, we will provide a theoretical discussion arguing that instead of making presumptions about institutional and firm-level capacities and capabilities, the emphasis must be on a 'presumption-free' analysis of both endogenous and exogenous factors of the process of innovation. We will offer a theoretical framework that goes back to basics of innovation theories and thereafter use the proposed framework as a basis for theoretical discussion on open innovation in the context of development and catching-up.

3. Emerging Consensus in the Theory of Innovation and its Discontents

Policy 'talk' is always bound to be not only simply a watered down version of theory but more importantly theory squeezed into sound bites fit for heated debates and condensed policy briefs and memos. In other words, policy 'talk' can be expected to be in some ways contradictory and even shallow. However, in this section we aim to show that the reasons why we see increasingly de-contextualised innovation policy in catching up regions such as EE and LA lay in the incoherencies within the wider framework of innovation theory. We will argue here that while there is in fact a somewhat surprising consensus emerging between neoclassical and evolutionary economists on the role of innovation and more widely on industry in catching up,

there are also serious discontents within this consensus. These discontents centre on different understandings of the nature and role of technology in growth and make it relatively easy for policy advice and transfer to become de-contextualised. Describing the contents and discontents within innovation theory, we can later discuss more precisely the potential impact and usefulness of 'new' ideas about innovation such as open innovation.

Emerging consensus on innovation and industry

While evolutionary economic theory has always stressed the importance of and the pivotal role played by innovation in economic growth and in particular in catching up, 'mainstream' or neoclassical theory also increasingly views innovation as an indispensable if not fundamental driver of growth. Suffice it here to refer to Krugman's work on increasing returns and economic geography (1991) or Rodrik's development economics (2007). Indeed, it is possible to create a common framework on innovation and development, or what we call emerging consensus in the theory of innovation. For this, the theoretical discussions of two 'competing' economic theories and their core authors (Nelson and Winter, 1982; Rodrik, 2007) will be used here.⁵ The aim of the framework is to highlight theoretical foundations that should be seen behind the conceptual models and tools used to think about the complex issues of innovation. The framework traces these foundations back to specific presumptions on two levels: firm and industry and the socio-economic institutional context. Figure 1 summarises the emerging consensus as a theoretical framework.

⁵ We use here Nelson and Winter (1982), and Rodrik (2007), respectively, as perhaps the most succinct and well-known expressions of both evolutionary and neoclassical thinking on innovation and development. While neither exhausts the possibilities of evolutionary or neoclassical thinking, both can be viewed as canonical for each tradition.

Figure 1. Emerging consensus for analysing development and innovation.

	Nelson and Winter (1982) - relations and actions of firms (and industry) within the wider (institutional) context	Rodrik (2007) - influence of the institutional context on the firm level processes
How do firms and entrepreneurs behave and innovate?	<p>Theoretical argument on firm behaviour is based on two distinct concepts - <i>organisational routines</i> and <i>search</i>. Companies have built in <i>patterns of action</i> and ways of determining future activities (regular and predictable skills based on 'remember by doing'), i.e. including limited scope of capabilities, procedures and decision rules. This makes firms' past experience increasingly important in predicting future actions - flexibility of routinised behaviour is of limited scope and changing environment increases the unpredictability and risks of survival in case the firms opt to modify routines.</p> <p><i>Search</i> denotes the organisational activities (characterised by irreversibility, uncertainty, and contingency - i.e. historically contextual) that are linked to the evaluation of the current routines that may lead to incremental or drastic changes or outright replacement of old routines; i.e. innovation is a deviation from/change of routine behaviour. Innovation is viewed as carrying out new combinations - reliable routines of well-understood scope provide the best components for new combinations. Firms also have well-defined routines for innovating efforts e.g. focussing firstly on pay-off factors vs. focusing firstly on new technological possibilities (cost and feasibility) and then on pay-off.</p>	<p>Rodrik's approach does not place explicit attention to the firm or entrepreneurial level and is concerned rather with a higher and institutional level of analysis i.e. getting the <i>institutions</i> (both market and non-market) in place for innovation and development.</p> <p>Yet, the argumentation is based on the presumption that there are two types of learning relevant to economic growth: a) <i>adaptation of existing technologies</i>; and b) <i>innovation to create new technologies</i>. Early in the development process, the type of learning that matters the most is the former one.</p> <p>In essence, the analysis is based on the idea that without proper institutional support the companies will not be able to pursue economic development and technological advance because of the possible negative impact of <i>learning externalities</i> and <i>coordination failures</i>.</p> <p>Thus, the entrepreneurial behaviour is conditioned by existing capacities that, for economic development, have to be increased - this can be achieved by better institutions or institutional support.</p>
How does the socio-economic environment relate to entrepreneurship and innovation?	<p>The organizational routines and search are embedded in the <i>selection environment</i> i.e. the ensemble of considerations which affect the well-being of the organisation and hence the extent to which it expands or contracts. This is partly determined by conditions outside the firms in the industry or sector being considered but also by the characteristics and behaviour of the other firms in the sector.</p> <p><i>Public policies</i> (incl. governmental and academic R&D) influence the search prospects of firms; in general this influence steers the private R&D endeavours (towards socially more preferred innovation and routines, e.g. clustering). The firms evolve over time (through joint actions of search and selection), with the conditions of industry in each period bearing the seeds of its conditions in the following period.</p>	<p>One of the premises of the <i>getting the institution right</i> principle is the increasing recognition that high-quality institutions can take several forms (i.e. function differs from form) and economic convergence does not necessarily have to be based on the convergence in institutional forms.</p> <p>Therefore, the impact of the socio-economic environment has to be studied in the mode of '<i>growth diagnostics</i>', i.e. analysing the differences of the 'binding constraints' on economic activities that differ across contexts and focusing on the most binding constraints.</p>

In the context of development and catching-up, we can again detect a large overlap between evolutionary and neoclassical thinking. From the evolutionary viewpoint, any kind of economic growth is viewed as a disequilibrium process that involves a mix (changing over time) of firms employing different vintages of technology (i.e. differences in production functions). It is time-consuming and costly for a firm to learn about and learn to use technology significantly different from familiar ones. Also, firms will differ in their awareness, competence, and judgments in choosing to adopt or not to adopt new techniques. The problem of economic development differs from the problem of general economic growth in the sense that the more

productive technologies that less developed country will adopt in the course of development/catching-up are usually known and have been employed in more developed countries (i.e. borrowing, imitating, adopting; instead of inventing).

Rather similarly Rodrik (2007) argues that the growth strategies for economic development policy need to be based on three elements: *growth diagnostics; policy design; institutionalization*. In essence, this provides a contextual analytical framework for bottom-up-based country-specific policy analysis (self-discovery of economic strengths and weaknesses). For Rodrik, the general 'industrial policy' challenges of developing countries that reduce the incentives for productive diversification and more sustainable economic development can be summarised into key externalities: information externalities (self-discovery of an economy's cost structure, i.e. imitation/adaptation possibilities) and coordination externalities (coordinating simultaneous and large-scale investments and also prioritisation of technologies).

In sum, despite different points of departure both approaches come together at a specific *contextual understanding of the process of innovation and economic development* from the perspective of developing countries:

- engines of innovation can be found at the firm-level processes (i.e. innovations influence the market);
- developing countries face significant challenges in achieving economic restructuring and sustainable development because capabilities and behavioural models of firms and industries in these countries are more capable of imitating, rather than innovating;
- challenges are grounded in the historical experience and development context and have developed into peculiar paths and behavioural patterns of firms that cannot be changed from outside, but have to transform in the contextually logical pattern of entrepreneurship (learning of skills, discovering strengths and weaknesses, i.e. even imitating requires learning and the accumulation of knowledge);
- the role of wider socio-economic institutions is to create additional incentives and capacities to support the self-discovery/search for better ways and modes of entrepreneurial activity.

Therefore, the context and suitable model of development is dependent on both the characteristics of the *socio-economic institutions* as well as *firm-level patterns of behaviour*. Thus, the problems are contextual, the end goal of policies and actions may be universal and consensual, but the path of development has to take into account the content and context of the problem and provide suitable solutions and development patterns.

From the discussion of the theoretical consensus, we can see that the policy development discussed above in the catching-up context often fails to follow the very basics of theory: *contextual understanding of problems and aiming policies at influencing dynamic firm-level capabilities*.

Discontents in innovation theory

The main point of discontent between evolutionary and neoclassical economists is the highly different understanding of technology and its role in catching up.⁶ More specifically, there are strong disagreements as what causes and stimulates innovations in the private sector. On the one hand, the evolutionary tradition argues that innovations and economic growth in general take place because of knowledge and skill agglomeration and continuous upgrading and technological change that are engendered by highly embedded policy-making of increasing coordination, dialogue and cooperation managed by a highly capable state and administration. On the other hand, the neo-classical and also public choice traditions argue that the main driver behind innovations and growth are trade and competition: the former using the comparative advantage of nations to bring more, better and cheaper goods to consumers (higher efficiency); the latter creating pressures for companies to incessantly innovate and outcompete the competitors, and to push prices downwards in the process (higher efficiency, again).

While the differences in details are of course greater than described here, it is important to see that both traditions can be traced back to Adam Smith's theorem that the division of labour is limited by the size of the market (1776). The difference lies in how one understands the theorem: the former school takes it to mean that *division of labour* is key (the creation of knowledge and technological diversity, and the producer with its capabilities are main policy goals), the latter school thinks the *size of the market* is key (the extent of trade and competition, and lower prices for consumers are main policy goals).

This difference goes back to understanding the nature of technological development and its impact on companies and economies. The evolutionary school argues that technological development is almost always path-dependent;⁷ neo-classical arguments assume that technology is essentially

⁶ For excellent summaries on the differences between the two schools, see Cimoli et al. (2006) and Drechsler (2004).

⁷ As expressed by Dosi and Soete: '*Technology ... cannot be reduced to freely available information or to a set of 'blueprints': on the contrary, each 'technological paradigm' with its forms of specific knowledge yields relatively ordered cumulative and irreversible patterns of technical change*'. (1988, p. 418)

freely available to all, competitors and countries alike.⁸ This view also assumes that technological development is more or less linear, towards ever more complex solutions yet with a rather clear path ahead. Thus, while neoclassical economists set out to rectify market failures that prevent the dissemination of technologies and skills, in the eyes of evolutionary economists, entrepreneurs seek technological innovation *in order* to create market failures. For evolutionary economists, technological development is anything but linear and technology is anything but freely available. Path dependencies, linkages, spill-overs, externalities, winner-takes-all markets and highly imperfect and dynamic competition make technology an unpredictable, high-risk and possibly high-return endeavour that drives on a tautological logic: technological development feeds on technological development.⁹ (See, e.g. Arthur, 1994; Perez, 2002) These characteristics engender long-term structural changes in the economies in form of technology trajectories, paradigms and geographical agglomerations. In particular since the early 1980s, evolutionary economists have emphasized the latter, long-term characteristics of economic development that are directly related to technology and innovation.¹⁰

Thus, even if neoclassical or mainstream economists admit the existence and the importance of increasing returns to scale due to technology and innovation (as, for instance, Krugman and Rodrik do), from evolutionary standpoint this is not only not enough; but without understanding the paradigmatic and path-dependent nature of increasing returns and technological development, admitting the latter into growth models only obscures the issue. In sum, while we are witnessing an important convergence between evolutionary and neoclassical schools on the role of innovation, there are key discontents between the two that go back to understanding the role of technology.

De-contextualised innovation policy engenders partially from these discontents, especially as the neoclassical thinking has had an enormous influence on international organisations such as the World Bank. In essence, understanding technology as neutral to context and development level, innovation

⁸ See, e.g., Sachs who argues that '*the very science and technology that underpin prosperity in the rich world are potentially available to the rest of world as well*' (2008, p. 205); similarly, the World Bank asks '*why is it that existing proven technologies are frequently not adopted by people who presumably would benefit most from these technologies*'. (2008b, p.3; see also World Bank, 2008a, p.18)

⁹ As importantly, in evolutionary understanding technology is a man-made comparative advantage that creates havoc in the Ricardian comparative advantage model (for a brilliant case study, see Murmann and Landau, 1998). What technological development shows is that the key is not trade as such but *what kind of trade* and *with whom*. (See Gomory and Baumol, 2004, and Palley, 2006 for an excellent discussions)

¹⁰ Key figures in this tradition are Freeman (1974; 1987); Freeman, Clark and Soete (1982); Freeman and Louçã (2001), Dosi (1982) and Perez (1983; 2002).

policies inspired by the neoclassical theories in fact greatly underestimate the context-specific nature of development – even against their own theories. In what follows, we show that the new fads in innovation theory such as open innovation, first, create an even stronger misconception about the role of technology in development; and second, from the evolutionary perspective, these new ideas can be understood as part of the prevailing techno-economic paradigm that emphasizes networks, modularity in production etc. Also, we will attempt to tie these issues back into the question of catching up and development using the theoretical consensus we depicted and adding the evolutionary icing in form of technological paradigms.

4. Can open innovation save development?

Previously we have noted that similarly to the systems-of-innovation discourse, the concept of open innovation lacks a proper catching-up perspective, but also sufficient research on the systems level. In the theoretical discussion, we have shown that the debate on innovation – to be sensitive to catching-up development – has to be looked at from at least two perspectives, the firm level and the socio-economic environment. The discontents in these theories have made it also pivotal to take into account the issues of technology and techno-economic paradigms.

Looking at the different levels of analysis witnessed in the context of open innovation, it would be an insurmountable task for an article to analyse catching-up peculiarities on all the levels where the implications of open innovation are of relevance. Therefore, we try to find in the literature on open innovation the lowest common characteristics that the different levels of research on open innovation have in common and try to link these characteristics to our theoretical frame. Further, based on the theoretical frame, we will look for characteristics that are of relevance both at the firm level and in the socio-economic context.¹¹

Open innovation, business models and catching-up

Based on Chesbrough (2008a, b; but also 2003; 2006), the novelty of open innovation can be seen in the equal emphasis placed on external and internal knowledge, i.e. the idea is derived from the exhaustion of and lack of competitiveness of the past business models and strategies of successful (mainly large and/or multi-national) companies (e.g., fewer economies of

¹¹ This is based on the argument that we have implicitly followed in our paper and explained in the theoretical framework that in the catching-up context, the mutual interdependence of variables linked to the firm level and socio-economic context are significantly pronounced as the catching-up process inevitably presumes the mutual development of these variables.

scale found in internal R&D processes and therefore also resulting from internal R&D). The open innovation concept offers a tool for systemising and explaining peculiar trajectories (and new complementary strategies) of development of these specific companies. As such, the concept looks at anomalies found in business practices that influence the competitiveness of companies, such as coping with spill-overs from industrial R&D and changes in intellectual property (IP) management (see Chesbrough, 2008a).

In this context, the main problem that open innovation tries to solve becomes one of finding proper strategies and business models (e.g., IPR systems and strategies; industrial R&D models and strategies; compatibility of the business model with those of suppliers, customers, competitors, complementors; cooperation with universities and other R&D institutions; etc.) to reap the benefits of 'de-verticalisation', or vertical specialisation (see Christensen, 2008; for ideal-type models, see Chesbrough, 2006, chp. 5). From Chesbrough, Vanhaverbeke and West. (2008), we can cite several issues where the concept of open innovation brings out a need for balancing between different strategies and priorities that may have contradictory effects on business models and strategies, profit and competitiveness perspectives; e.g.:

- finding a balance between concentrating on core competencies vs. creating and maintaining capacities for technological foresight and adoption (e.g., searching the market for new ideas and technologies) (chp. 1);
- balancing between competencies related to creating technological innovations vs. capacities related to sourcing or integrating such technological innovations (chp. 14);
- balancing the potential of gaining benefits from appropriability vs. benefiting from openness (chp. 6);
- balancing between the capabilities of value creation vs. value capture (chp. 8).

From this, we can see that much of the debate and strategic direction advocated by the open innovation is largely conditional, i.e. dependent on specific firm-level characteristics, but also maybe more implicitly on the wider socio-economic context.¹² This is largely due to the fact that the original

¹² Interestingly, Chesbrough (2006) has himself indicated that depending on the characteristics of the firms, the strategic options may largely differ: e.g., larger firms are likely to have more IP 'resources' to be utilised compared to small firms. This implies that the open-innovation-based business model of large firms could rely more on buying and selling IP while smaller firms are limited to collaborating and sharing strategies. The latter is more likely to threaten the core competencies of companies (see, e.g., the example of GO Corporation in Chesbrough 2006, pp. 35-37; p. 34 for theoretical argument: '*You cannot be an informed consumer of external ideas and technology if you don't have some very sharp people working in your organisation*'). This line of reasoning can also be extended to the differences in the level of technological development between companies, but also between regions.

concept and theory itself is derived based from empirical observations of some and mostly leading companies and businesses that have changed their strategies and model of innovation or, more precisely and importantly, added new perspectives to their previous practices (that is, becoming 'post-Chandlerian' - see Langlois, 2003; also Chesbrough, 2008b) by adding the external perspective to their R&D practices and business models.¹³ This has significant implications on how one should perceive this concept in the context of developing countries and companies coming from and doing business in these countries/regions.

We see open innovation firstly as a conceptual strategy or generic conceptual/theoretical model – that in different formations can be linked to the levels of analysis of open innovation – for specific companies for overcoming the discrepancies between R&D systems and business models and overcoming the problems of R&D spill-overs by complementing internal R&D strategies with external strategies.¹⁴ This idea is strongly linked to the general understanding in open innovation that '*not the technology as such but the business model grafted upon technological innovations opens up new business opportunities*' (Vanhaverbeke and Cloudt, 2008, p.264; also Chesbrough, 2003; Chesbrough and Rosenbloom, 2002); or

There is no inherent value in a technology per se. The value is determined instead by the business model used to bring it to market. The same technology taken to market through two different business models will yield different amounts of values. An inferior technology with a better business model will often trump a better technology commercialized through inferior business model. (Chesbrough 2006, p.43; see also 2003)

¹³ Also, Chesbrough's original work and theorising (2003; 2006; 2008a, b) is closely linked to observed practical problems that modern companies have been facing, some being firm level (e.g., problems of discrepancies between motivation and reward systems of R&D units vs. business units, resulting in the underutilisation of internal patents, shelving ideas and therefore creating corporate costs); others being caused by developments at the socio-economic level (e.g., increasing practice of university patenting of public research resulting in further barriers to diffusion of knowledge and slowing down the speed of innovations). The research so far has concentrated mainly upon *what particular firms can do* in the generic environment that is influenced by both internal and external factors, but the variables found in the generic environment are largely taken as given or exogenous to the strategies of firms.

¹⁴ Chesbrough (2003, figures 1-1 and 1-3; 2008b) has argued that the open innovation approach provides a solution to the perceived problems of rising costs of innovation (increasing costs) and shorter product life in the market (decreasing revenues) by transforming R&D and IP strategies so that the increasing costs of innovation are avoided through the leveraging of external development, and decreasing revenues are re-established by creating new revenues through licensing, spin-offs, sales/divestiture etc. Therefore, the argument advocates for supplementing the basic/core business model or core competencies - based on internal investments in development and revenues from the 'own market'.

Business models, IPR management strategies, networking practices on different levels and public policies can be seen to be developed based on this principle, i.e. the concept of open innovation has come from the observation of practices and experience of companies and has been developed into an explanatory and prescriptive paradigm/framework (Chesbrough, 2008a, b).

Based on our theoretical framework for catching-up countries and the discontents between different innovation theories, we argue that the underlying principle should be more in line with the following reasoning: *taking into account that technology and the level of technological development is sine qua non, not the technology as such but the business model grafted upon technological innovations opens up new business opportunities*. By explicitly indicating the presumptions behind the concept of open innovation – firms retaining their (or having as a starting point a particular type of) core competencies and absorption capacity, whatever their specific strategies of openness¹⁵ – we can link together the two levels of analysis, meaning that the capacities and capabilities of firms (for adopting R&D strategies, business models etc.) are contingent on both firm-level characteristics and socio-economic and techno-economic characteristics. In fact, both levels are contingent on each other. Moreover, in the context of the techno-economic paradigms and taking into account the nature of the current ICT-driven paradigm (for more detail, see Perez, 2006), it is relatively obvious that open innovation as a business model is mainly a strategy for large and established technology companies to reinvent and ‘align’ themselves to the changing global technological and economic context.

In the first section of the paper we have argued that research has revealed and theory has argued that the companies in catching-up context have peculiar and by definition weakened capacities for innovation and for the routinisation of technological innovations into business models (i.e. the companies tend to be imitators or adopters of external technologies – especial-

¹⁵ This argument is also linked to the discussions of asymmetric knowledge capabilities of Cooke (2005) or learned organisational capabilities of Chandler (1990; 2005), but also more generally to the consensus of innovation theories that we have analysed above. Also, this would support an argument that open innovation strategies seem to be particularly useful for increasing the competitiveness or technological advantages - by accommodating business models to the changing external conditions - of companies that have already achieved a considerable first-mover advantage and have accumulated significant technological and organisational capabilities through cumulative learning etc. Suffice it here to mention the description by Chandler (2005) of the foundations of development of RCA in consumer electronics, IBM in computer industry; but also the description by Mowery (2009) of the development of the US industry at the beginning of the 20th century. In understanding these developments, the key factor is the importance placed on the initial starting position - the level of learned organisational capabilities; the existence of barriers to entry; the potential to benefit from economies of scale and scope, i.e. first movers creating their industries by establishing integrated learning bases that embody their technical and functional capabilities (Chandler, 2005) - compared to existing but also emerging competitors. We would argue that the open innovation approach does not explicitly emphasise these factors, but clearly takes them into account.

ly technologies 'known' already in developed countries –, as opposed to being innovators). On the one hand, this is due to the factors at the firm and industry levels, specifically often out-dated core competencies, lack of experience and learning by doing, historical path-dependencies and legacies (e.g., the non-traditional structure of Soviet industry – see Radosevic, 2009). The concept of open innovation is mute on how companies in catching-up countries should deal with these issues; the concept presumes that companies are able to assess their capacities and adjust strategies of openness and business models respective of their self-assessment. Therefore, we see that the concept does not overcome the discontents of 'mainstream' innovation theories at least on the firm level. On the other hand, the problems in the context of catching-up development are also due to external factors, for instance factors related to policies of innovation and development (from education to trade). This will be elaborated upon in the next sub-section.

Open innovation, systems of innovation and catching-up

On the systems level – systems of innovation – most of the research on open innovation has remained rather vague and conceptual. The emerging critique of the current open innovation literature (see Dahlander and Gann, 2007) argues that the current approach has not been correctly placed within the earlier innovation literature (belonging to the closed innovation paradigm, according to Chesbrough; for Chesbrough's own account see 2008a, pp. 5-7) that also emphasised the benefits of exploiting external environment. Most notably, they refer to arguments proposed by Marshall (1919) concerning external linkages and division of labour in innovation processes that require openness and collaboration between different stakeholders; to Kline and Rosenberg (1986) who deal with highly complex feedback loops and interaction in innovation; but also to Freeman (1991) (and also network literature) who argues that connectivity with external actors is crucial for maintaining the innovativeness of enterprises, etc. Thus, it is argued (Dahlander and Gann 2007, p.10) that '*any criticism of the linear model of innovation ... can be construed as an argument for open innovation*'.

Thus, there seems to be a lack of clarity what the open innovation approach provides once the analysis moves beyond the firm level and the managerial approach. The systems of innovation approach and the open innovation paradigm have important similarities – the main similarity being the mutual recognition of the importance of knowledge spill-overs that both the systems of innovation (e.g. Lundvall, 2010) in general, and particular enterprises (Chesbrough, 2008a; 2006; 2003) can benefit from. The difference between the two approaches stems from the level of analysis: systems of innovation has taken a macro-or a meso-economic level of analysis (national and regional systems of innovation), and open innovation has been con-

strained to the individual firm-level analysis (for more detail, see de Jong et al. 2008, pp. 28-30).

On the level of the systemic socio-economic and institutional context, we argue that the open innovation concept seems to offer a misconception rather similar to the discontents of the innovation theory that we have discussed above, i.e. the specific role of technology and its role in catching up. We argue that this misconception contradicts the capacities and capabilities found in the catching-up countries, or even threatens the innovation logic of these economies.

Concerning this claim, one of the core assumptions of the open innovation concept and of openness-based business models is that companies can search the external and global environment for ideas, skills, new technologies and information that is embedded in the national or local innovation systems all around the world (see Vanhaverbeke, 2008; also Cooke, 2005b). The open innovation research once again exemplifies this with the experiences of the large multinational and global companies that can benefit from these search activities. Yet, the open innovation theorising is contingent on the mutually reciprocal benefits of openness (achieved through trade regimes, IPR models, inter-firm/academic/global networks etc.); i.e. companies from different clusters or systems of innovation open up their capacities and resources in order to get access to other agglomerations of knowledge, technologies and capacities present in these very agglomerations or elsewhere. On the one hand, this is once again dependent on the capacities of companies that we discussed in the previous sub-section.

On the other hand, we have shown in our theoretical framework that catching-up countries are usually technology takers/adaptors, and that the socio-economic environment and the agglomerations of knowledge and capabilities by definition lag behind in the catching-up countries. Furthermore, Vanhaverbeke (2008, p.216) has stressed that open innovation is fostered within particular institutional settings:

... there exist huge differences in the knowledge capabilities of regions depending on the presence and the level of global competitiveness of clusters and regional innovation systems. Since the effectiveness of open innovation strategies of companies is strongly related to the presence of regional innovation systems, these regional differences can also explain why some regions are much more successful in attracting multinationals ensuring a steady flow of workers and entrepreneurs.

In this context Vanhaverbeke (2008, p. 217) refers to the works of Cooke (e.g. 2005a; 2004) and the concept of 'regional knowledge capabilities' as

drivers of globalisation as well as the claim that *'instead of organisation of industry determining spatial structure, the economic geography of public knowledge institutions determined industry organisation'*. The concept and ideas behind the 'regionally asymmetric knowledge capabilities' of Cooke (2005b) offer a different level of perspective, but rather complementary ideas to the concept of 'learned organisational capabilities' of Chandler (2005; also 1990). Complemented with the relevance of technological capabilities and the level of technological development that we have argued is a pivotal variable in the context of developing/catching-up regions, we can see that the open innovation concept faces two specific implications.

Firstly, as by definition the general socio-economic context of catching-up regions (national/regional innovation systems) are characterised by the prevalence of mature or already utilised technologies, companies moving towards more open business models may have less to gain from the external strategies as the market they are entering is different from what the open innovation concept takes into account. Indeed, when open innovation is used as a business model in highly developed regions/clusters, it is intended to lower entry barriers for new knowledge and linkages; however, in lagging regions, this same business model does not in fact lower any significant barriers. Secondly, as the capacities and the potential of companies are generally dependent on the level of development of their home markets, companies from the catching-up regions may be inherently disadvantaged at competing, but also at collaborating on the global market because of incompatibilities of the R&D structures, business models and strategies. Therefore, this would inevitably threaten to lead to cherry-picking or selective tapping-in by large multi-national companies of limited and fragmented knowledge and capacities of catching-up regions. Of course, the argument would follow that these kinds of contacts may act as one source for increasing the learning capabilities and accumulation of knowledge in catching-up countries (more of a neo-classical argument).

Paradoxically, the experience of EE and LA has empirically shown that the problem as such has also been present in the context of openness in macro-economic policies (the WC policies) resulting in primitivisation of industries and limited socio-economic appropriability of the positive implications/spillovers of these links. The problem remains that international/global companies are in general not interested in the entire local production chain, potential of the cluster etc. of catching-up regions, but on specific aspects of these production chains that can be used for cost-reduction or for complementing the core processes of the firm. Open innovation seems to only shift the emphasis from this discontent of innovation and catching-up development from the macro-level policies to the firm-level policies and strategies. But the solutions to these discontents remain a systems- or policy-level challenge.

Further, this also follows back to the characteristic claim of open innovation that not the technology per se but the business model grafted on technological innovations is the root of new business opportunities. We argue that looking from the socio-economic level this argument falls into the same category of the classic neo-classical de-contextualised line of reasoning. The theoretical research from the evolutionary point of view and empirical research on techno-economic paradigms and cycles of development have shown that differences in technological capacities and positioning in the international value-chain determine the competitiveness of industries/clusters/systems of innovation. The consensus on catching-up innovation theories seems to agree that catching-up countries are significantly disadvantaged from this perspective as they are more likely to be technology takers/imitators. The logic of theories of de-verticalisation, modularity and outsourcing (all basic principles of open innovation) implies that catching-up countries are largely influenced by what can be labelled 'migration' or relocation of technologies and industries (for recent excellent research, see Hobday, 2009; Nurse, 2009), i.e. developing through technologies that have become obsolete or uncompetitive to be exploited in the cost structure of developed regions.¹⁶

Therefore, we argue that in the context of catching-up regions, the concept of open innovation and its implications both at the firm and the more systemic level offer perspectives and potential for development for which catching-up countries lack capacities and capabilities to take advantage of. Paradoxically, as open innovation is still based on the idea of firstly competition and only thereafter cooperation and openness, entering the environment of open-innovation-based R&D and business strategies would open the catching-up regions to forces that are more likely to dominate or control these regions than to offer avenues for increasing capabilities and finding new business opportunities. Of course, research based on case studies following the line of the mainstream open-innovation research (i.e. successful companies acting on a global arena) would tend to contradict our claim, but these companies have already succeeded in the existing socio-economic context – i.e. in the context without explicit understanding of the

¹⁶ Chesbrough argues (2006) that the openness of business models results in two types of benefits: *outside-in processes* and overcoming the problem of 'not invented here' (NIH) would enable the companies to 'purchase-in' technologies, patents and knowledge needed for increasing the value-added of the core processes of companies; *inside-out processes* and overcoming the problem of 'not sold here' (NSH) (that can be seen to be a more fundamental transformation in the business model proposed by the open innovation concept) would enable companies to create extra value from their core processes and technologies (through licensing etc.) and from selling the redundant technologies and knowledge that has resulted from the loose coupling between the R&D processes and business models. Companies in catching-up countries are by definition dependent on the outside-in processes, but their core problem is the challenge of moving-up the value-chain in production and technological development. Open innovation propagated business models do not seem to have a cure for this challenge.

open innovation paradigm, but also without an explicit impact on the socio-economic development and catching-up processes at their home turf. What matters in the catching-up development are the socio-economic outcomes and effects of innovation, competition and cooperation.

5. Conclusion

In this article we have discussed whether the concept of open innovation offers new solutions and potential avenues for the development and innovation processes of catching-up regions. We have looked into this question taking into account the needs of the catching-up context both from the perspective of firms (i.e., will open innovation help companies to increase their competitiveness) and even more importantly from the perspective of socio-economic development (i.e., will business practices and policies based on the concept of open innovation lead towards sustainable socio-economic development and catching-up). Our analysis has been based on three levels of reasoning.

Firstly, we have argued that from the perspective of the catching-up context, most of the innovation discourse has been de-contextualised, i.e. both academic/theoretical and policy-level discourse on innovation has been developed based on the experience of the developed countries and context. There is convincing literature that confirms that the Eastern European and Latin American countries have already largely failed once in their innovation policies because of this de-contextualisation (i.e., using Washington Consensus based policies for development).

Secondly, we have argued that despite the seemingly emerging consensus in theories of innovation – both evolutionary and neo-classical approaches emphasising *contextual understanding of problems and aiming policies at influencing dynamic firm-level capabilities* –, the domination of the policy discourse by the neoclassical discourse (WC-based policies and understanding of innovation and technological development) has resulted in the very same de-contextualisation of innovation discourse. We argue that the reason for this stems from the misunderstanding of the role of technology and technological development by the neoclassical school of thought, that is by understanding technology as neutral to context and development level, innovation policies inspired by the neoclassical theories in fact greatly underestimate the context-specific nature of development – even against their own theories.

Thirdly, taking the above into account, we have discussed whether open innovation offers new avenues for developing policies and business models in catching-up contexts. In this context, we have argued that the concept

of open innovation is based (similarly to previous innovation discourse) on rather explicit and contextual presumptions: it is based on the experience and research in the context of large/multinational companies of highly developed countries and technological markets; it is a firm-level approach that currently lacks systemic contribution to the systems/socio economic level; etc. Therefore, the debate and strategic direction advocated by the open innovation is largely conditional, i.e. dependent on specific characteristics of the firm level and wider socio-economic context.

We have indicated that presumptions or conditionalities of the concept of open innovation do not take into account the peculiarities and differences that characterise both the firms and the socio-economic context of catching-up regions. We have also argued that the presumption of the open innovation paradigm – that *not the technology as such but the business model grafted upon technological innovations opens up new business opportunities* – does not hold in the context of catching-up regions because of the fundamental differences and implications of the level of technological development and inherent catching-up logic. This underlying difference between contexts makes the open-innovation-based arguments over strategic business choices (tackling the trade-offs and contradictions of R&D processes, business models, etc) and public policies less plausible.

In sum, in our view the open-innovation concept lacks proper attention to the underlying principle of the emerging consensus in innovation theory – *contextual understanding of problems and aiming policies at influencing dynamic firm-level capabilities*. Being and remaining ‘technology-neutral, or -indifferent’ in its arguments and conceptual theorising, the concept of open innovation does not seem to offer the potential for becoming relevant for catching-up development, at least on the policy level, where the potential solutions to the problems of catching-up largely reside. Therefore, both innovation policies and the international discourse on innovation and development of catching-up regions should be more sensitive to the ‘basics’ of the theories of innovation and technological development.

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