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FZID Discussion Papers

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Discussion Paper 48-2012

**SEN MEETS SCHUMPETER. INTRODUCING
STRUCTURAL AND DYNAMIC ELEMENTS
INTO THE HUMAN CAPABILITY APPROACH**

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ISSN 1867-934X (Printausgabe)
ISSN 1868-0720 (Internetausgabe)

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Sen meets Schumpeter. Introducing structural and dynamic elements into the human capability approach

Dominik Hartmann¹

Abstract: This paper argues for the necessity and potential of introducing Schumpeter's understanding of economic development as structural change into Amartya Sen's people-oriented development as freedom approach. Sen and other authors on social choice, human development and inequality have effectively promoted – through the United Nations Development Programme - that the expansion of human agency, well-being and capabilities are the means and ends of development (Sen, 1999). However, this approach has led to a neglect of structural and technological aspects of economic systems such as social network dynamics, technological progress and the structural changes in the variety and balance of economic activities. Innovation driven socioeconomic change has decisive influences on the capabilities of the actors to be active agents in the development processes. For instance, the variety of economic sectors in a country and the access to information and finance networks determine occupational choices and learning opportunities. Economic diversification and social network dynamics follow evolutionary paths that can contribute to human development, but also intrinsically drive success-breeds-success mechanisms and inequality reproduction. Therefore, an agent oriented evolutionary theory of inequality and qualitative change has to take these structural features of economic development into account.

1 Introduction

The world is complex. Fostered by new opportunities for data storage, computing and analysis, development economics increasingly take this complexity into account and new integral and systemic development approaches have emerged. The human development and capability approach essentially focuses on individuals, their freedom to choose, their capability to determine their own life. Nevertheless, the human development approach could also be viewed as understanding the freedom of people in a complex and evolving environment. The instrumental freedoms distinguished by Amartya Sen (1999) – (1) political freedom, (2) economic facilities, (3) social opportunities, (4) transparency guarantees and (5) protective security - intrinsically signify this complexity. Much more than just countrywide growth is needed to provide people with substantial ability to determine their own life and be agents rather than patients. The freedom of actors is influenced by a large number of factors, ranging from political and social to environmental and economic aspects. The different levels of analysis are interrelated.

To understand complexity we need to understand how the different elements of a socioeconomic system (people, firms, organisations, etc.) are interconnected and what the feedback loops between individuals' freedom and systems' evolution comprise. Furthermore, it is of substantial importance to recognise that both individuals and the

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system are evolving. Neither a general equilibrium of the system nor a fixed level of agents' capabilities exists. Both are evolving over time. The capabilities and opportunities (might) change over time, as people learn and interact with other individuals. Socioeconomic systems are permanently changing. The simple facts are that people are dying and children are born and that learning processes and innovations do not allow for a steady state or general equilibrium of the system.

In this paper we suggest a theoretical framework to gain new insights into the complex relations between the freedom of the agents and the complex evolving system they are living in by combining some essential lessons of neo-Schumpeterian economics with Amartya Sen's capability approach. Specific focus will be put on the need to put more emphasis on the role of social networks, learning and innovation-driven evolution of economic variety on the freedom of actors. The paper proceeds as follows. Chapter two explains the rationale of our aim to combine the human capability approach with insights from neo-Schumpeterian economics. Chapter three discusses some basic concepts of both lines of research, such as interactive learning and structural change from Schumpeter and basic needs and development as freedom from Sen. Chapter four proposes a set of pillars for a viable roadmap to combine both approaches. A common starting-point could be an agent-oriented perspective on development, taking the great heterogeneity of human beings seriously. Furthermore we indicate the role of social networks and the evolution of economic variety on the freedom of actors and propose to apply a broad concept of entrepreneurship and innovation. Chapter five argues the need to apply agent-based modelling and social network analysis techniques to realise in-depth analysis of the reproduction of inequalities and the feedback loops between agents' capabilities and the system's evolution. Chapter six describes policy implications and concludes.

2 Why combine Schumpeter with Sen?

Some authors posit the promising idea of combining innovation economics with Amartya Sen's capabilities approach for a deeper understanding of structural bottlenecks in innovation and development in less advanced countries (Johnson et al, 2003; Arocena and Sutz 2005; Lundvall, 2007). In this vein, we aim to explore new theoretical and empirical insights by integrating two different but complementary fields of research:

- (A) Amartya Sen's agent-oriented view on development and inequality (e.g. Sen, 1995, 1998, 1999) and
- (B) Joseph Alois Schumpeter's concept (and subsequent neo-Schumpeterian work) of economic development as innovation-driven qualitative change through the introduction of new combinations (Schumpeter, 1912, 1939, 1943; Hanusch and Pyka, 2007a).

The main point shared by the disciplines is a bottom-up approach considering the great heterogeneity of people and their capabilities, notably in sharp contrast to mainstream neoclassical economics and the representative agent.

Inequality research and especially the capability approach has made substantive advances towards a better understanding, measurement and recognition of the inequality of the substantial freedom of people (inter alia provided by education, health, income) to determine their own life and assist actively in development processes (UNDP, 1990; Nussbaum and Sen, 1993; Sen, 1995, 1999). The expansion of the substantive freedoms of

people is seen as the primary means and ends of development (Sen, 1999). Little emphasis has been placed however on the impact of innovation and structural change on the freedom of people.

Neo-Schumpeterian economics analyses the generation, implementation and diffusion of knowledge and technology, putting emphasis on the decisive role and impacts of entrepreneurship and innovation on sectoral dynamics and qualitative change (e.g. Saviotti, 1996; Hanusch and Pyka, 2007b). Unfortunately, neo-Schumpeterian economics fails to analyse the ‘destructive’ part of the ‘creative destruction’ processes nor does it consider what is happening to the people who do not have the capabilities and opportunities to assist in the innovation and development processes.

The main goal of combining these two approaches is a better understanding of the mutual impacts between creative destruction processes and the freedom of actors. We claim that development and (in)equality should not just be considered as reaching some determined levels of well-being, justice, sustainability or any other specific feature of socioeconomic systems at a determined point in time. Crucially it also has to take into account the continuous introduction of incremental and radical innovations, the permanent as well as disruptive changes of the system. The history of many innovations has shown that structural change, driven by the introduction of novelties and related co-evolutionary processes, is deeply influenced and has significantly impacted on the inequality of agents’ capabilities and opportunities. For example, creative destruction processes enabled by the French revolution, the American Civil War, different radical technological and organisational innovations (such as steam power, electricity, Taylorism, Fordism, ICT, etc.) have had deep impacts on the lives of people and their abilities to achieve a high standard of living. The freedom of these agents to become active through development has been extremely diverse in terms of space and time as well as social class, sometimes changing disruptively, sometimes changing slowly but permanently. Persistent novelty and endogenous change are leading to new combinations and organisation of existing resources, new set and distribution of social choices (e.g. for employment and consumption) and interaction patterns between agents. This qualitative change underlying economic development has a decisive influence on the freedom of agents.

To the best of our knowledge, there are few works which seriously consider within an evolutionary framework the impact of structural change and innovation on the capabilities of people to be active agents in the development processes (e.g. Carlota Perez, 2007; Arocena and Sutz, 2005).² There are even fewer works which analyse the impact of the distribution of the freedom of actors on the type and direction of permanent and disruptive creative destruction processes.

3 Development as freedom vs. development as qualitative change

In essence we aim to integrate two different views on and insights into development: (A) development as the expansion of freedom of the individuals and (B) development as

² Naturally there is also a large number of analyses which put emphasis on the systemic reproduction of inequalities between social classes (Marx and post-Marxian economics) and/or the process of structural change within capitalistic systems (e.g. Pasinetti, 1981,1983). In our agent-based view, however, these types of analysis lack basic understanding (promoted inter alia by Schumpeter and Sen) of the great heterogeneity and variety of human beings.

qualitative (/structural) change driven by the introduction of novelties. In this chapter we briefly discuss some of the important concepts and insights of both. Whereas the first approach underlies an ethical, social choice and inequality perspective, the second approach puts emphasis on entrepreneurship, innovation and changes in the composition, structure and organisation of the system.

3.1 From basic needs to development as freedom

Since the 1970s the perception has been growing among development practitioners that the efforts put into industrialisation and economic growth have not led to a significant reduction of poverty and inequalities in developing countries. They failed to provide the poor sectors of the population with basic requirements such as water, electricity, health care and education. In some areas social indicators have worsened while the overall GDP shows considerable growth rates. This discussion was triggered in the late 1970s and early 1980s, situating the basic needs of people in developing countries as the focus of interest (ILO, 1976; Streeten, 1979; Steward, 1979; Streeten et al, 1981). The purpose of development was seen as reducing mass deprivation and giving all individuals the opportunity to live a *full life* (Streeten, 1979). The concentration of development policy on economic growth and unemployment was considered insufficient. Meeting the basic needs of people should be the first priority of development policy: emphasis on basic education, nutrition, sanitation and health care not only contributes directly to the alleviation of poverty and the reduction of fertility but also improves directly and indirectly productivity and economic growth of countries by using resources efficiently and helping to increase them (Streeten et al, 1981).

In 1990, a group of economists led by Mahbub ul Haq and including renowned economists such as Amartya Sen, Paul Streeten and Keith Griffin presented the so-called Human Development Index (UNDP, 1990). They combined GDP per capita with life expectancy and levels of education to trace a more comprehensive and broader picture of development, focusing on the social choice and life quality of people. Whereas former development approaches concentrated almost exclusively on efficiency and growth, the human development concept proposes a switch towards an agent-based perspective. Human development is defined as a process of enlarging people's choices and enhancing human capabilities (the range of things people can do) and freedoms, enabling them to live a long and healthy life, have access to knowledge and a decent standard of living, and participate in the life of their community and decisions affecting their life (UNDP, 1990). This entails a focus of development policies on 'advancing the richness of human life, rather than the richness of the economy in which human beings live, which is only part of it' (Amartya Sen³).

Amartya Sen introduced the important idea of development as the expansion of the capabilities of human beings. He asked the important question 'equality of what?' (e.g. Sen, 1995). In Sen's agent-oriented view of development, underdevelopment is unfreedom, whereas development is an integrated process of profound changes (Sen, 1999). The extensions of freedoms that give humans capabilities, opportunities and choices to assist and actively contribute to development are at the same time the primary goal and fundamental means of development (Sen, 1999). It is worth stating that the human capability approach is a main theoretical contributor of a new perspective which actually

³ See cite in <http://hdr.undp.org/en/humandev/origins> [12.06.2008]

believes in the power, intelligence and determination of the poor to help themselves when they are given the basic opportunities and freedoms to do so (see Yunus, 2007).

Sen's approach has received considerable interest from neo-Schumpeterian economists. Sen's capability approach provides a theoretical bridge to connect, adapt and apply neo-Schumpeterian approaches with a focus on learning capabilities and capacity for entrepreneurial action to underdeveloped countries and development policy. The human capability approach (as well as the Schumpeter Mark I approach) views the world from the perspective of individuals and their capabilities to be and do. This is in sharp contrast to the common approach of social sciences, which essentially view the individual from a macro-perspective, where the representative agent is determined by the system. Notably, in the real world, there is already a raft of policies and practices at work which combine the understandings of both Sen and Schumpeter. Important examples include the microfinance revolution and the promotion of social entrepreneurship enabled by Muhammad Yunus, Bill Drayton and others (Bornstein, 2004).

3.2 Neo-Schumpeterian economics and the innovation systems approach

Owing to the qualitative shift towards knowledge-based economy, enabled by the ICT revolution and thriving capitalist globalisation, innovation research has rapidly expanded in the last decades (e.g. Fagerberg et al, 2005; Hanusch and Pyka, 2007b). We concentrate here on the basic ideas of Joseph A. Schumpeter's theory of economic development and recent theoretical and empirical insights of modern innovation systems research.

3.2.1 Basic concepts of Schumpeterian economics

In his 'theory of economic development' (1912) and subsequent work (e.g. Schumpeter, 1939, 1943), Joseph Alois Schumpeter illustrated development as a historical process of structural changes, essentially driven by innovation. He defined innovation as new combinations leading to new products, processes, organisation, inputs and markets (1912). Furthermore he divided the innovation process into four dimensions, *Invention*, *Innovation*, *Diffusion* and *Imitation*, and put the dynamic entrepreneur in the middle of his analysis (1912). In Schumpeter's theory, the ability and initiative of the entrepreneurs, drawing upon the discoveries of scientists and inventors, create entirely new opportunities for investment, growth and employment. The profits made from these innovations are then the decisive impulse for new surges of growth, acting as a signal to swarms of imitators (Freeman, 1982: p.2). Not every imitator makes big profits. When the bandwagon starts rolling, some people fall off, profits are gradually 'competed away' until recession sets in, and the whole process may be followed by depression before growth starts again with a new wave of technical innovation and organisational and social change (Freeman, 1982:p .2). In Schumpeter's analysis, the invention stage or the basic innovation has less of an impact, whereas the diffusion and imitation process have a much greater influence on the state of an economy. The macroeconomic effects of any basic innovation are scarcely perceptible in the first few years and often even longer. What matters in terms of economic growth, investment and employment is not the date of basic innovation, but rather the *diffusion* of basic innovation, the swarming process, the period when imitators begin to realise the profitable potential of the new product or process and start to invest heavily in that technology (Freeman, 1982: p.5).

Based on the concepts of Schumpeter (1912, 1939, 1943) a large number of studies on entrepreneurship, innovation, interactive learning and structural change has been performed (for an overview of current approaches of neo-Schumpeterian and innovation economics see for example Fagerberg et al (2005) and Hanusch and Pyka (2007b). A decisive feature of Schumpeterian analysis is the consideration that structural changes may be driven by the capabilities of an individual entrepreneur (Schumpeter, 1912) and/or (the research labs of) big enterprises (Schumpeter, 1943). The emphasis on heterogeneous agents is in sharp contrast to the common perspective of most approaches in economics, where the representative agents are determined by the system. Other interesting features of Schumpeterian economics are the consideration of historic development processes and paths as well as the emphasis on the interaction of heterogeneous agents (Hanusch and Pyka, 2007a; Hanusch and Pyka, 2007b). Generally, 'Neo-Schumpeterian Economics deals with dynamic processes causing qualitative transformation of economies driven by the introduction of various and multifaceted forms of novelties and the related co-evolutionary processes' (Hanusch and Pyka, 2007a). Qualitative change, punctuated equilibria (considering the idea of permanent and disruptive changes) and pattern formation are major characteristics of the neo-Schumpeterian analysis of economic development (see Hanusch and Pyka, 2007a, Hanusch and Pyka, 2007b).

Whereas the mainstream concept of structural change refers to a change in the number and balance of sectors, the neo-Schumpeterian economics' concept of qualitative change is broader as it also considers changes on more disaggregated levels (e.g. the organisational structure between and within enterprises of a sector) as well as changes in not strictly economic domains such as education or regulation (Saviotti, 1996, 2006). Qualitative change is considered to be essentially driven by innovation and some important drivers of innovation are interactive learning processes and entrepreneurial action.

3.2.2 Innovation, creative destruction and the freedom of actors

Various technological innovations (e.g. steel, steam power and electricity), organisational innovations (e.g. Taylorism, Fordism and Toyotism) as well as social innovations (e.g. the French Revolution, the implementation of social security systems) have certainly had important impacts on the social choices of actors, their freedom to be and do and their ability to achieve certain life standards. For example, industrialisation led to difficult adaptation processes in which some freedoms were suppressed and others expanded. Many workers were exploited in the industrial production machine and had to live in inhuman conditions. On the other hand, many people achieved higher incomes, better access to education and new choices and opportunities within the expanding cities. Nascent worker movements and syndicates have been fundamental to the establishment of many social policies and rights of individuals today. Industrialisation has led to both higher general levels of human freedom - in the sense of an expanding set of social choices - and also to an expansion of inequality between the freedoms of the actors. The same is happening with the information and communication revolution. On the one hand it has paved the way for expanding knowledge flows, higher global welfare and a large set of new opportunities (e.g. education through distance, health services, etc.). On the other hand it evoked a new threat to the poor in the form of the digital divide. Hence, the important question is how to reduce the negative implication of innovation and creative destruction processes and how to foster the positive ones.

3.2.3 Insights from the innovation system approach

Since the end of the 1980s, the term national innovation system (NIS) has gained a lot of attention in the academic world. Christopher Freeman (1987) defined the term *innovation system* as ‘*the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies*’ (Freeman, 1987: 1). Several basic elements of the latter NIS approach appear in this short sentence as it indicates a systemic approach of action and interactions between different institutions at different stages of the innovation process. An important feature of innovation is its predominantly interactive and collective character. Bengt-Åke Lundvall promoted a broad definition of NIS as ‘*all parts and aspects of the economic structure and the institutional set up affecting learning as well as searching and exploring*’ (1992: 12). There are many other definitions of NIS (e.g. Patel and Pavitt, 1994; Nelson, 1993; Metcalfe, 1995; OECD, 1997; Edquist, 1997), but the essence is captured quite well in the definitions given by Freeman and Lundvall. As argued by Heidenreich (2005), the basic elements of every NIS definition consist mainly in (A) the central importance of institutions, (B) the systemic underpinnings considering interactions between different actors, (C) the recognition of the different important stages of the innovation process as well as (D) a certain conceptual ambiguity. This last characteristic can be considered as the major weakness as well as the major strength of the NIS approach (Johnson et al, 2003). Trying to give a better explanation for the complex real-world phenomena, the systematic approach of NIS research considers the importance of manifold interactions and learning processes between the different economic, social and political institutions. The specific history, culture, customs and social interaction structures between the members of a country influence its economic performance and capability to innovate. There cannot be a single definition of an innovation system, whether it is good or bad. The NIS approach must be adapted to the specific determinants and path dependencies of every single country or region (e.g. Cassiolato et al, 2003).

An interesting attempt to analyse innovation systems in the southern part of the world was made by the Global Network for Systems of Learning, Innovation and Competence Building Systems (Globelics). One focus of Globelics is on the interplay between innovation, learning and inequality. Srinivas and Sutz (2008), for example, argue the need for a better understanding of scarcity-induced innovation. ‘*To innovate or to solve problems in a technological universe characterized by scarcity requires the development of a series of skills – learnt by doing, by searching, by interacting and by solving - that are idiosyncratic: we term them capacities to innovate in scarcity conditions*’ (Srinivas and Sutz, 2008: 135). They claim that local and national efforts have to be made to promote local capacities for endogenous problem-solving and innovation. The South is rich in creative people overcoming daily problems by innovative solutions. These innovative capabilities should be expanded. Arocena and Sutz (2005) argued that a combination of capabilities and opportunities is necessary to pave the way for evolutionary learning in underdeveloped settings. A good formal education is not enough, if people do not find the possibilities to apply and enlarge their capabilities through learning processes (Arocena and Sutz, 2005). It is fundamentally necessary to understand that it is not just the skills or capabilities of the agents (e.g. provided and fostered by education, health services, etc.) but also the lack of opportunities (access to finance, information flows, variety of economic activities) which prevents/hinders many people in developing countries from advancing through learning by doing, solving processes and entrepreneurial action.

Johnson et al (2003) argue that a parallel emphasis on basic needs and innovation is necessary for the long-run development of a fertile national system of innovation. Couto Soares and Cassiolato (2008) claim the need to integrate innovation and social policies to promote socially oriented innovation. Palliative interventions to tackle extreme poverty may not be sufficient to overcome the systemic reproduction of inequalities. Long-run development requires a fertile national innovation system (and STI policies) oriented to meeting the social needs of the people (Couto Soares and Cassiolato, 2008). Naturally, innovation is not the only factor impacting on inequality and poverty or vice versa, but often it may have decisive mutual feedback loops. Cozzen and Kaplinsky (2009) show that the causalities of innovation, poverty and inequality are not unidirectional but multilayered and complex. There is no straightforward answer to the questions of whether one causes the other, whether they are just coincidental or whether they co-evolve. Sometimes innovation reflects and reinforces inequalities and sometimes it undermines them. More in-depth analysis of the linkages between different types of inequalities (e.g. horizontal or vertical inequalities), of innovation (e.g. process, product, functional and chain innovation) and competence building is necessary (Cozzen and Kaplinsky, 2009). Hence inequality and innovation research can and should learn from each other.

4 Sen meets Schumpeter

The integration of Amartya Sen's capability approach and (neo-)Schumpeterian analysis of innovation-driven qualitative change can shed new light on the evolution and reproduction of inequalities, especially with regard to the ability of people to engage in learning and entrepreneurial action. The basic idea of combining both approaches has already been proposed by a number of other authors and some valuable partial advances made (Arocena and Sutz, 2005; Srinivas and Sutz, 2008; Cozzen and Kaplinsky, 2009). Nevertheless the main question remains unresolved: how can we combine both approaches in an integrated theoretical framework which takes the feedback loops between the agents' freedom and the system's evolution into account? And what could be the theoretical pillars of such an integrated theoretical framework?

We propose the integration of both approaches via the heterogeneity of individuals, as well as analysis of how the interactions between individuals (social networks) and the evolution of economic variety affect the agents' opportunities to be and do, to learn and to determine their own lives. The following theoretical pillars may be essential for a fertile integration of these approaches:

- (A) heterogeneity of the actors and a bottom-up approach
- (B) a broad perspective on entrepreneurship and innovation
- (C) the freedom to innovate
- (D) the role of interaction (networks) and economic variety
- (E) the need to apply new methodologies (e.g. ACE)

4.1 Heterogeneity and a bottom-up approach

The qualitative change introduced by Amartya Sen and basic needs scholars to social welfare theory by allowing the interpersonal comparisons of well-being and focusing rather on the freedom of people to live a life they have reason to value than on mere

aggregated economic growth (e.g. Streeten et al, 1981; Nussbaum and Sen, 1993; Sen, 1998, 1999) has paved the way for:

- A) putting the agents into the centre of development policies and treating them rather as agents than patients of the development process (United Nations, 1990);
- B) in a theoretically innovative as well as empirically, mathematically and ethically sustained way getting rid of the neoclassical representative agent; and
- C) considering human diversity, (e.g. in Sen, 2006) and focusing on the heterogeneous capabilities and opportunities of people to assist, contribute to and benefit from development processes (Sen, 1999).

Sen's capability approach provides a promising theoretical bridge with the agent-based approaches of neo-Schumpeterian (especially Mark I) approaches, in which the capabilities and opportunities of agents to introduce new combinations into the system are of fundamental importance for their individual success and the development (=structural change, creative destruction processes) of the overall system. The emphasis on the heterogeneity of the actors is a substantial pillar of neo-Schumpeterian economics (Dopfer, 2005; Hanusch and Pyka, 2007a). Learning processes and innovation can hardly be explained by means of the neo-classical representative agent and within a general equilibrium framework. Research in cognitive psychology and experimental economics (Kagel and Roth, 1995; Plott and Smith, 1998) shows that a series of neo-classical assumptions, such as representative utility-maximising rational agents, are at odds with empirically observed patterns of behaviour and interactions on the micro level (Pyka and Fagiolo, 2007). In neo-Schumpeterian economics learning and the cognition of the agents are central. Heterogeneous and bounded rational actors learn and search experimentally in uncertain and ceaselessly changing environments (Pyka and Fagiolo, 2007). Without a minimum willingness to cope with true uncertainty (Frank Knight, 1921), innovation processes can hardly be understood (Pyka and Fagiolo, 2007). The agents are essentially heterogeneous and bounded rational beings. They have limited information, make mistakes and engage in trial and error processes (Dosi et al, 2005). If the agents already knew everything they needed to, there would be no room for true learning processes and innovation (Pyka and Fagiolo, 2007). As neo-Schumpeterian economics views innovation as a collective phenomenon deriving from the interactions of heterogeneous agents, the heterogeneity of the agents is an important source of novelty (e.g. Saviotti, 1996).

4.2 A broad approach of entrepreneurship and innovation

Several authors argue the need to apply a broad concept of innovation (e.g. Mytelka, 2000; Cassiolato et al, 2003; Lundvall, 2007; Hanusch and Pyka, 2007a). Despite the fact that innovation is most visible at the industry level, innovation occurs at all levels and domains of socioeconomic systems, e.g. not just in the industry but also in the public and financial sector of the economic system (Hanusch and Pyka, 2007a). It is important to state that innovation - in a broad sense - does not necessarily mean new high-tech products, nano- or biotech, ICT, etc., but rather the introduction of new combinations and novelties leading to systemic restructuring and qualitative change into any dimensions of socioeconomic systems (be it on the global, national or local level). This can happen within high-tech enterprises, regions and sectors, but also in local communities of the Amazon, in small enterprises in Eurasia or in social organisations anywhere around the world. Therefore, by

the term innovation we generally understand the *introduction of novelties or new combinations into the system which leads to a qualitative change of the status quo*. Furthermore, in contrast to the heroic perspective on the entrepreneur (inter alia promoted by Schumpeter, 1912!), we assume that most human beings have the potential for entrepreneurial action. Maybe not everybody could be global leader and introducing systemic changes to the global economic system, but yes virtually everybody is able to introduce changes on the local level and in the close social network. There may be people with more motivation, intelligence and luck than others, but we should not exclude people ex-ante from contributing to change. Every individual should be given the basic possibility to engage in entrepreneurial action. Naturally, there will be a significant number of the population who do not want to engage in entrepreneurial action, but it is one thing not to want to do something and quite another to lack the basic freedoms to do so. All over the world we can find examples of entrepreneurial actions in all races and social classes, from the micro-business entrepreneurs of Bangladesh or the founders of social organisations elsewhere to the high-tech entrepreneurs of Silicon Valley. Entrepreneurship and structural change are not just limited to the economic sphere but happen in all domains and levels of socioeconomic systems. For poverty reduction, higher levels of trust and social welfare not just economic entrepreneurship matters, but also the introduction of novelties and social changes by different agents (individuals, groups and institutions) from the social, cultural, political and environmental sphere of life (e.g. Bornstein, 2004; Yunus, 2007). Therefore we apply a broad concept of entrepreneurship and consider *entrepreneurial action as the active engagement of people to change the status quo of their lives, families and socioeconomic environment, aiming to achieve higher levels of social welfare, power and wealth for themselves and others*.

4.3 Inequality, networks and economic variety

In socioeconomic systems, people and their capabilities and opportunities cannot be properly understood just by considering their individual, physical and mental set-up as well as the resources and things to which they have rights; we need essentially to understand that each actor is also embedded in a network of social, economic and political interrelations (Granovetter, 1985). The very enriching concept and work of Amartya Sen (e.g. 1995, 1998, 1999) and other authors on social choice, human development and inequality (e.g. UNDP, 1990; Nussbaum and Sen, 1993; Bourguignon et al, 2005; Milanovic, 2007) tend to dwell insufficiently on structural and evolutionary aspects of socioeconomic systems and their impacts on the opportunities of actors to be active agents in development processes. Inter alia, the evolution of the variety of local economic activities and social network structures (e.g. power, access to non-redundant information and finance) are decisive determinants of people being active agents and adapting to the evolutionary changes of the socioeconomic systems in which they are living.

Social network analysis (e.g. Granovetter, 1973, 1985; Burt, 1992; Castells, 1996) has shown that every person is embedded in a network of social and economic relations which determine their opportunities for jobs, their access to finance and information, their power and capacity for matching economic and social problems. Inter alia, Manuel Castells (1996) indicated that the modern network society (enabled by ICT technologies) provides the opportunities for better social inclusion but also implies the threat of further exclusion of people, depending on their position and their access to social network structures. The position of individuals in the local, national and global network structures is of essential importance for their social and economic opportunities, their capacity for qualitative

entrepreneurship, their opportunities to engage in learning processes and their ability to achieve a better living standard (e.g. Castells 1996; Granovetter 1973, 1985; Woolcock and Narayan, 2000; Hoang and Antoncic, 2003; Casson and Della Giusta, 2007).

Furthermore, several economists (e.g. Jacobs, 1969; Pasinetti, 1981, 1983; Saviotti, 1996) have shown that variety of economic activities is both a driver and an outcome of economic development, having a decisive influence on the possibilities of knowledge spillovers, entrepreneurship and the introduction of new combinations into the system.

Notably, social network structures and the composition of economic activities are not static but follow evolutionary development paths, changing at different speeds over space, time, people and cultures. The type and speed of these structural changes depend on a series of endogenous (and exogenous) factors such as the entrance and exit of agents (e.g. through birth and death), the distribution of wealth and power (implying specific interactive structures), the existing technologies, learning processes, accumulation of knowledge and innovation.

4.4 The freedom to innovate

Innovation economics has drawn attention to interactive learning, networks and entrepreneurship as important drivers and determinants of innovation (e.g. Fagerberg et al, 2005; Hanusch and Pyka, 2007ab; Cassiolato et al, 2003). Modern literature on entrepreneurship has shown that entrepreneurs are not heroic individuals but essentially draw on and are embedded in social network structures (Aldrich and Zimmer 1986; Hoang and Antoncic, 2003; Casson and Della Giusta, 2007; Bornstein, 2004). Furthermore, innovation system research in developing countries has revealed that it is the combination of capabilities and opportunities which paves the way for sustained learning processes and innovation (Arocena and Sutz, 2005).

In the light of these theoretical and empirical insights we propose to consider some new dimensions of the freedom of people: namely their capabilities and opportunities for *networking, learning and engaging in entrepreneurial action*.

These freedoms are formed and evolve in the interplay between individuals' capabilities and systems' structure and evolution. Unequal distribution of capabilities and opportunities for networking, learning and entrepreneurship essentially contributes to inequalities in terms of achieving certain living standards. Inter alia, the exclusion from social network structures (e.g. Internet, corruption) and the lack of opportunities for qualitative entrepreneurship (e.g. lack of finance) and for applied learning limit the freedom of agents to be and do and introduce qualitative change to their lives. The social network structures and the variety of technological and economic opportunities in a system have a decisive impact on the set of social choices of individuals to be and do, to translate their capabilities into functionings, and to expand their capabilities through learning processes. Conversely, entrepreneurial action, networking and learning of individuals have decisive impacts on the structure and evolution of the system.

We also have to consider another dimension determining the process of evolutionary learning and the translation of capabilities into functions: namely the incentives, i.e. motivation structure for networking, learning and entrepreneurial action. Individuals may have both the capabilities and opportunities but lack the incentives and motivation to

become active, and to engage in learning, networking and entrepreneurial action. Hence, we propose the following working tables for further in-depth discussion and analysis.

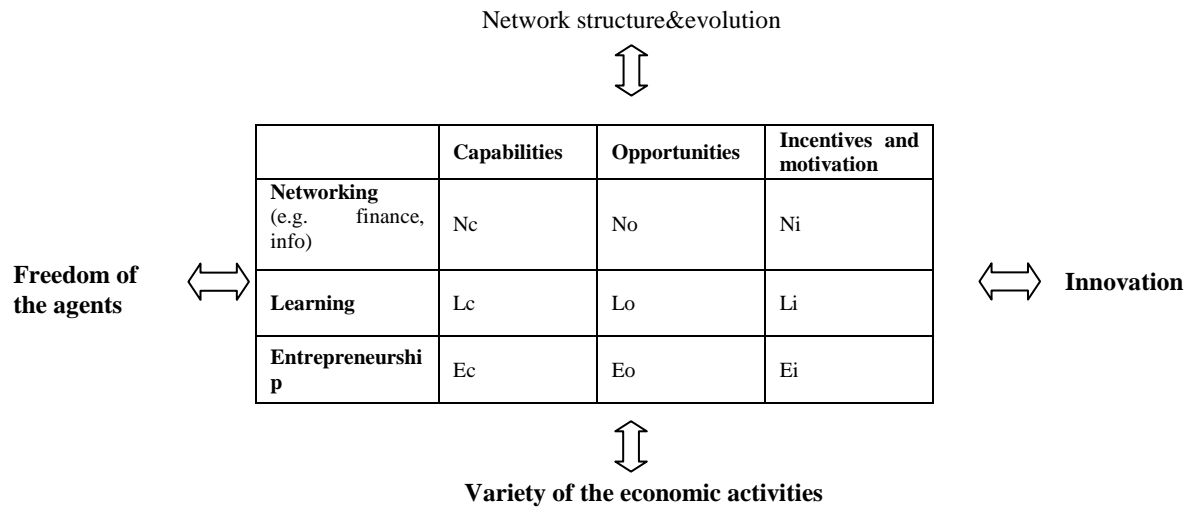


Figure 1: A framework to study the relations between freedom of the agents and economic structures and dynamics

Clearly, several of the dimensions described in the rows and columns of the matrix are overlapping and interdependent. For example, qualitative entrepreneurship is dependent on networking capabilities and incentives for networking are dependent on capabilities for networking (e.g. determined by cognitive skills). We suggest that the capabilities, opportunities and incentives/motivation for networking, learning and qualitative entrepreneurship are interrelated but not identical. Thus, each of the elements and intersections within the matrix has to be analysed individually as well as together with the other elements.

Naturally, the importance and interdependence of these elements may differ from one socioeconomic system to another, but from a theoretical perspective it is more important to:

- (1) show that these elements exist;
- (2) link socioeconomic inequality directly with the capacity for innovation and structural change; and
- (3) take into account that social networks and economic variety (as structural elements of the system in which people are living) have substantial impacts on the freedom of individuals.

4.5 Insights from network and variety research

Subsequently we discuss some essential concepts from network and variety research and their implications on the structure, emergence and reproduction of inequalities.

4.5.1 Impact of variety evolution on the freedom of actors

The interdependences between the freedom of agents and the variety of economic activities are multilayered. The freedom of actors to learn, engage in entrepreneurial action and innovate could lead to a rise in economic variety, whereas a greater variety of economic activities could expand the social choices and opportunities of the individuals. The distinction and relations between economic development and human development have been in the focus of interest of the human capability community. However, to our best knowledge until now, there has been no analysis scrutinizing the relations between economic diversification and human development. A terminological distinction between diversity and variety is in order. Stirling (2007) distinguishes between three different components of diversity: namely variety, balance and disparity. Variety indicates the number of categories in a system, balance measures how much of each category exists and disparity analyses how different the categories are.⁴

The role of economic diversification for economic development:

Imbs and Wacziarg (2003: p.64) showed that countries diversify over most of their development path. At very robust levels of income per capita (approx. 9000 \$ in constant 1985 US dollars) an increasing sectoral concentration is recognisable. Only very highly developed countries show some type of sectoral concentration. It is crucial to note that Imbs and Wacziarg actually measure the balance of employment and value addition between determined sectors. Thus they do not analyse the diversification of economic activities in the sense of a variety growth nor analyse the level of disparity between activities. Nevertheless the implications are important as they undermine - showing strong empirical evidence - the Ricardian suggestions of increasing specialisation through the force of comparative advantages. The growing global variety of activities, product, processes and intrasectoral diversification and the emergence of new sectors are completely ignored by this analysis, which defines ex ante the sectors to be considered. Pier Paolo Saviotti (1996, 2006) has argued that growing efficiency and qualitative change enabling variety growth are both drivers and outcomes of long-run economic development. Variety growth leading to new sectors and productivity growth in pre-existing sectors are complementary and not independent aspects of economic development (Saviotti, 1996, 2006). Efficiency growth is not enough, because the decrease in required inputs and labour may lead to an important bottleneck in economic development as production would exceed demand (Passinetti, 1981, 1983; in Saviotti, 2006). Hence, economic variety has to grow to make capitalist development viable. Conversely, efficiency growth is necessary to allow freeing up of the capital resources needed for search activities. Although in the short to medium run, one or another country may specialise by making use of comparative advantages, in the long run, every country may have to diversify to stay competitive and avoid becoming impoverished (Saviotti, 2006). Hence variety growth is a necessary requirement for long-term economic development. Drivers of economic variety growth may be learning processes, entrepreneurship and innovation.

⁴ The specification of variety and balance is essentially influenced by the evaluation of disparity. The definition and classification of disparity essentially governs the resolution of categories used to characterise variety and balance (Stirling, 2007). Disparity alone, however, does not indicate the balance between the elements, however, as it actually requires knowledge of the existing variety and may not consider variety evolution properly.

It is worth stating that innovation and creative destruction processes may lead to the replacement of old activities by new ones, but some of the older activities always survive and coexist with the new ones, thus leading in sum to higher levels of variety and qualitative changes in the composition of the system. Economic development is not just production and productivity growth but essentially implies structural and qualitative changes in the composition, structure and organisation of the system. 'Economic development has never been a purely quantitative phenomenon, but it has always involved qualitative change in economic systems' (Saviotti, 2006: 1). This qualitative change is essentially driven by innovation, by the emergence of new products, processes, sectors and organisations, etc.

The impacts of economic diversification on human development:

There are multiple reasons why the evolution of variety and subsequent changes in system composition have an essential impact on the freedom of actors. Most importantly efficiency growth without variety growth would tend to create high levels of unemployment, as the input requirements would shrink. Within a market economy system, rising efficiency without diversification of the economy would endogenously lead to higher levels of inequality and unfreedom. Hence, either variety growth and/or strong institutions with the capacity for significant income redistribution are necessary to prevent the system destabilising levels of inequalities and provide every individual with a minimum level of ethical acceptable freedom in comparison with other individuals. A very strong version of the second option (e.g. materialised in a socialist system) tends to provoke economic inefficiencies and implies essential unfreedoms for the actors. Hence, within a democratic (and evolutionary) market economy, continuous diversification and development of the socioeconomic structures is indispensable. There are several reasons to criticise this permanent diversification or economic development (most importantly the exploitation of natural resources and the tendency to undermine the long-run ecological sustainability). Greater variety of socioeconomic activities, however, may also amplify the social choices of individuals, e.g. the activities in which they can engage. Furthermore, a higher level of economic variety allows the actors to be more flexible and amplify their knowledge in different searching, exploring and learning activities. Therefore, variety opens up the possibilities for entrepreneurial action and new combinations. Jacobs (1969) indicated that diversity in cities may provide actors with opportunities to do old things in new ways. A large variety of economic and social activities may essentially enhance the creativity and freedom of the actors to be and do, to choose and to learn. The freedom and creativity of the actors may essentially lead to new combinations(/innovations) and hence expand in a virtuous circle the existing variety and set of opportunities and social choices. A possible downside of this expansionary evolution - to be discussed in further work - may be the rising capability requirements of individuals to match the rising complexity of the environment in which they are living. In evolutionary and diversifying systems, the actors may have to reach higher levels of human development and capabilities to be free. In any case, whether we see diversification and variety growth as positive or negative, the great impact on the freedom of actors is obvious and thus has to be taken into account.

4.5.2 Social networks and the freedom of actors

Social networks analyses (SNA) (e.g. Scott, 1991; Wasserman and Faust, 1994; Borgatti et al, 2002; Mrvar et al, 2005) provide valuable theoretical insights and analytical tools for understanding the interrelations between the freedom of actors and system evolution. SNA

studies the content, structure and evolution of the network of social relations between agents, as well as the position and power of the agents within these networks. Two fundamental levels of analysis can be distinguished: (A) analysis of the overall network structure and (B) the individuals' relations and roles within a larger network.

4.5.2.1 Network structure and evolution

The structure of the networks in a socioeconomic system has decisive implications for the cohesion and stability of the system, the absorption and diffusion of knowledge and the distribution of power and social choices within a system. Recent theoretical and empirical evidence suggests that the topology and evolution of real-world networks are governed by robust organising principles such as preferential attachment, small world phenomena and scale-free attribute (Watts and Strogatz, 1998; Barabasi and Albert, 1999; Albert and Barabasi, 2002). We briefly present three common measures of network topologies with decisive implications for the freedom of actors: *average path lengths*, *clustering coefficient* and *degree distribution*.⁵

The *average path length* measures the average number of steps along the shortest paths for all possible pairs of network nodes. It can indicate the cohesion of a social network as well as the speed with which resources can be reached or information can be spread within a network. Innovation may change the average path length and speed of knowledge diffusion. For example, the ICT revolution led to significantly shorter path lengths for obtaining valuable information from and for (!) the people who were connected. It opened up new opportunities but also evoked new threats for the poor. Whoever is connected to the Internet may have (faster) access to valuable new information, attend education per distance, etc. Whoever is not connected (still a large percentage of people in developing countries) may suffer further social exclusion and comparative disadvantages, however.

Clustering refers to the fact that in many larger networks there are subgroups bound together to form cliques, circles of friends, etc. where everybody knows each other. The degree to which nodes tend to cluster together can be measured by the so-called *clustering coefficient*. This coefficient measures the degree to which tightly knit subgroups with dense and transitive connections exist within a network. Inter alia Watts and Strogatz (1998) illustrated that in many large networks (e.g. power grids, networks of movie actors) high clustering coefficients coexist with short average path lengths. In other words: 'We move in tight circles yet we are all bound together by remarkably short chains' (Strogatz, 2003). This has important implications for knowledge diffusion and the social capital of individuals. Information can be spread quite fast throughout the network but, as we discuss in the subsequent section, the travel path of information depends on certain actors who connect the subgroups. These agents may be called brokers or hubs and have higher control and power over the flow of resources and knowledge.

Clustering may have positive and negative implications for the freedom of actors and the groups of which they are members. On the one hand it can provide the agents with

⁵ Many terms used in (social) network analysis may sound odd concepts of science, but in substance they may have substantial implications for the freedom of actors, the inequality of opportunities and power. Inter alia, the scale-free character of many social networks implies large differences in the opportunities of the actors to access material and immaterial resources, and it constrains the social choice and power the individuals have.

valuable social capital they can draw upon (e.g. Woolcock and Narayan, 2000), and on the other hand it may fix inequalities between different social groups and circles (e.g. Bourdieu, 1983). Furthermore, brokerage between groups may provide the bridging agents with higher power and thus introduce interpersonal inequalities.

Degree distribution measures the difference in the number of contacts of the nodes within a network. In a network, different nodes have different numbers of contacts, some having more or fewer than others (=degree of the node). Albert and Barabasi (1999, 2002; Barabasi and Albert, 1999) have shown that the degree distribution in large real-world networks (e.g. protein and citation networks, power grids and several social networks, etc.) follows a power law distribution. That means that these networks have a long tail of nodes with few connections (green part of the graph) and a few nodes have many connections (yellow part). Because there is no typical number of connections per node, these networks are considered to be scale-free or scale-invariant. This has important implications for inequality, as the actors with many connections have a larger set of opportunities to access resources and information than the actors with just a few links. Often the latter are dependent on the former, highly connected and bridging nodes, which have higher power over the systems' resources and knowledge flows.

Endogenous reproduction of inequalities: Barabasi and Albert (1999) attempted to explain the emergence of scale-free networks through a mechanism of preferential attachment. Thereby nodes tend to attach to nodes that are popular (still having a considerable number of connections). This mechanism can be defined as the 'rich get richer', as the nodes which already have many linkages tend to receive exponentially more new linkages than the 'heavy tail' of weakly connected nodes. This leads to a highly unequal distribution of power in the system, where a few nodes exercise considerable control over the network relations (e.g. information flows) and many nodes are dependent on the former.

4.5.2.2 Position of individuals

The structural analysis of networks provides important insights into systemic patterns and mechanisms of inequality and inequality reproduction. Nevertheless, these types of analyses say little about the impact of the type and strength of the relations of single individuals. Therefore we aim briefly to present three important concepts from social capital theory, namely the strengths of weak ties (Granovetter, 1973), network closure as social capital (Coleman, 1988) and the so-called structural holes (Burt, 1992).

Granovetter's analysis (e.g. 1973, 1985) revealed that access to valuable new information (e.g. information on job opportunities) might rather be accessed by so-called weak ties. Weak ties are the connections of one person (x) to another (y) who do not form part of the group of people or clique who frequently interact and interchange information (=strong ties). The information flowing within a clique may be redundant, whereas connections to members outside the clique (weak ties) could provide new ideas and information (e.g. job opportunities). In a related vein, Burt (1992) draws attention to the role certain strategic network positions play in the possibility of individuals, for example, achieving better positions and awards within organisations. In Burt's view a strategic position (brokerage) between otherwise unconnected groups provides an individual with power and access to distinct rather than redundant information. People who are closer to so-called structural holes are expected to achieve greater economic awards and higher probability of advancement. In another vein Coleman (1988) argues that strong and redundant ties with

many mutual interactions are important to reduce opportunistic behaviour, enable shared norms and provide a fertile climate of trust which is necessary for fine-grained information transfer and coping with information ambiguity.

From a neutral perspective it may be the adequate combination of strong and weak ties as well as the position and role of a person within the network which provides her/him with different capabilities and opportunities to access and control the material and immaterial network flows. An individual might require both a network of strong ties on which s/he can rely, as well as access to weak ties able to provide her/him with new information and opportunities necessary for economic success and the integration of new knowledge.

5 Which methodological tools will be required?

The important question remains what analytical tools and methodologies we need to analyse and model the complex interrelations between the freedom of heterogeneous actors and system evolution. There are many different possibilities to enter into the complexity, such as case studies, historical structural analysis, network analysis or econometrics. A recent promising methodology is agent based simulation modeling (ABM). It allows to model, think through and analyse the dynamic feedbacks loops and pattern formation. Generally speaking, ABMs aim to explain dynamic processes and emergent properties of complex systems (on the meso and macro level) by the interaction of heterogeneous agents on the micro level (see Fagiolo and Pyka, 2007; Tesfatsion and Judd, 2006). With ABMs we can model the heterogeneous capabilities of actors (Morone and Taylor, 2006) as well as evolutionary changes of systemic features such as the variety of local economic activities and social network structures (Saviotti and Pyka, 2004; Pyka and Saviotti, 2005). This enables us to combine the profound understandings of Joseph Schumpeter and Amartya Sen:

- (A) the Schumpeterian concept of development as historical process of endogenous systemic changes and pattern formations driven by the introduction of innovations and co-evolutionary processes, and
- (B) the profound understanding of Amartya Sen of the diversity of human beings and the need to provide every human being with the basic capabilities and opportunities to determine their own life and be active agents of development.

By means of ABMs the human capability approach can be set in an evolutionary model considering endogenous changes in individuals' capabilities and the system structure through learning processes, interaction, competition and cooperation. Inter alia the freedom for entrepreneurship, networking, knowledge transfer and learning can be studied within an agent-based model, the reproduction of inequalities analysed and the impact of different policy measures simulated (e.g. Pyka et al, 1999; Cantner et al, 2001; Grebel et al, 2003; Morone and Taylor, 2007; Pyka et al, 2007; Pyka and Fagiolo, 2007). Hence, ABMs may be an interesting methodological alternative for understanding the evolution of human capabilities in a complex evolving system.

Nevertheless, from a qualitative perspective the derivation of theoretical causalities and interrelations from an analytical analysis combined with agent-based simulation models approaches cannot stand alone but should to be sustained by empirical data. Theoretical and simulation results have to be sustained in case studies and econometric analysis. To

calibrate the model and provide each individual with a different set of capabilities econometric analysis and household data could be used (see e.g. Morone and Taylor, 2004, 2006).⁶

6 Conclusions and policy implications

In order to gain a better understanding of (A) the reproduction and evolution of inequalities and (B) the interrelations between agents' capabilities and system evolution, this paper suggested some theoretical pillars (heterogeneity of agents, consideration of social networks and variety evolution, a broad concept of entrepreneurship and innovation) to introduce to the inspiring capability approach of Amartya Sen the dynamic and structural features of Schumpeter-based analysis of economic development.

The focus on covering basic needs (health, education, income, etc.) and providing the basic capabilities to assist in the development processes is not enough, as economic and social policies also have to understand the systemic features and evolutionary paths of the respective socioeconomic systems. Structural and evolutionary features have a deep impact on the capabilities and opportunities of people to be active agents and adapt themselves to the ongoing creative destruction processes. Inter alia economic variety and network structures are important to the economic structures and the opportunities of actors to engage in entrepreneurial action, benefit from economic development and make change for themselves and others possible. Therefore development policy must not just focus on providing the actors with basic capabilities to live a decent life (e.g. health care, education, food, clothes) but has also to engage in parallel with the promotion of fertile and inclusive network structures as well as horizontal and vertical economic diversification and integration which provide more actors with the opportunities to assist, contribute to and benefit from the development processes of their socioeconomic environment. Strategic structural intervention and incentives are necessary to provide people with the opportunities to apply and enlarge their knowledge by learning by performing, using and innovating activities (Arocena and Sutz, 2005; Lundvall, 2007) and promote fertile creative destruction processes.

From a theoretical perspective there is still a lot of work to be done to develop a consistent agent-based theory on inequality and evolutionary change. Nevertheless we suggest that the heterogeneity of individuals as well as the variety and social networking structure of the system may be fertile elements of such a theory, which considers the feedback loops between the freedom of the actors and the system's structure and evolution. This general framework allows for a large number of possible applications (on the local to global scale,

⁶ So-called history-friendly models (e.g. Malerba et al, 1999; Pyka and Saviotti, 2005) are based upon intensive empirical studies of the (sub)system to be studied (e.g. a region, industry). An interesting ABM on knowledge diffusion with complex cognition has been designed by Morone and Taylor (2004, 2006). In the model, the individuals are endowed with different cognitive maps and interact with each other by means of local and cyber networks. Depending on their initial cognitive maps (determined by the access to education), their contact with proximate agents (e.g. people, organisations, etc. in the neighbourhood) and their connections to more distant actors and information through cyber-networks (e.g. highways, the Internet), the individuals have different freedoms to engage in learning processes and accumulate knowledge. Thereby learning processes and path-dependent formation and reproduction of inequalities can be simulated, analysed and explained within the model. The model has been calibrated by using household data on education, neighbourhoods and access to the Internet in the metropolitan area of Santiago de Chile (Morone and Taylor, 2004)

and in different dimensions of social, economic and political life) without losing its general validity. Although we put emphasis on the need for agent-based modelling efforts, a large number of theoretical and empirical, qualitative and quantitative studies are possible and necessary if we are to gain a deeper understanding of the interrelations between the freedom of actors and innovation-driven qualitative change.

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