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SYSTEMS OF INNOVATION BETWEEN GLOBALISATION AND TRANSFORMATION: POLICY IMPLICATIONS FOR THE SUPPORT OF SCHUMPETERIAN ENTREPRENEURSHIP

Introduction

The international policy agenda is currently shaped by the motive of competitiveness, which has been designed as a device to cope with the combined processes of globalisation and regionalisation. Economic, institutional and social change is ubiquitous, as the character of production, service-provision and even consumption is increasingly marked by a knowledge-intensive pattern. This mirrors the emergence of an innovation-driven knowledge-based economy on a global scale. The global evolution of capitalist market economies is divided into various sub-processes which may be identified in territorial terms. The Central and Eastern European economies, for instance, constitute one of these sub-processes, for the breakdown of state-socialism and the resulting economic transformation need to be viewed in terms of a global change. The economic and social transformation of Central and Eastern Europe thus runs parallel with the transformation of international capitalism towards a knowledge-based economy. This transformation is accompanied by economic and political crises which reflect the impact of technological and institutional change.

The challenge of analysing the relationship between innovation, development and the growth performance of national economies has fuelled a renaissance of Schumpeterian thought. Schumpeter's theory of economic development acknowledges various types of economic agents, with the most prominent type of the entrepreneur whose function is characterised by the capability for creative response. In contrast to an adaptive attitude which denotes a habitual response to changes in the data environment, creative response enforces economic change by introducing novelty. It represents the decisive endogenous factor of an undetermined economic evolution. The entrepreneurial function is historically conditioned. It is carried out by individuals, while Schumpeter also hinted at the role of intra-firm co-operation and even the state in certain historical situations. The social and institutional environment within an economic formation marks the articulation of Schumpeterian entrepreneurship. These institutional dimensions have been reformulated by recent Schumpeterian and evolutionary approaches to technological innovation which underline the entrepreneurial role of institutional networks. Placed in this context, the systems of innovation approach puts the analytical focus on the manifold relations between institutions, organizations and technology. Systems of innovation denote networks of institutions and organisations that take part in the generation, modification and diffusion of innovations, embedded in a particular territorial setting. While systems of innovation support the growth performance of national or regional economies, their structural and institutional features define the processes of learning and innovation. From a Schumpeterian perspective it is crucial to understand the entrepreneurial aspects of economic change within an innovation system.

This paper argues that recognising the interdependent technological, organisational, institutional and spatial aspects of innovation and change is an indispensable condition for the design and implementation of effective innovation policy measures. The actual functioning of capitalism needs to be understood in order to come to useful conclusions. The emerging knowledge-based economy is based upon institutional and structural variety which allows for integrating the components of entrepreneurial action, structural change and economic growth. The function of Schumpeterian entrepreneurship is executed by various economic and social actors whose specific modes of conduct are affected by the institutional configurations of the corresponding innovation systems. Therefore it is proposed that the entrepreneurial functions within a system of innovation may be treated from the perspective of a 'systemic entrepreneurship'. This suggests that entrepreneurship is rooted in the institutional configuration of an innovation system, also integrating the corresponding functions of invention and finance. Systemic entrepreneurship thus constitutes a highly relevant policy aspect in the knowledge-based economy. Applied to Central and Eastern Europe this points to the necessity to implement innovation policies which are sensitive to local specificities, derived from historical and cultural aspects.

The paper is structured as follows. First, the Schumpeterian approach to entrepreneurship and economic development is reconstructed, with an emphasis on its institutional aspects. Second, the systems of innovation approach is discussed by pinpointing the relationship between institutional and technological change. Third, the concept of systemic entrepreneurship is discussed and applied to the matter of identifying the entrepreneurial elements within the institutional networks of innovation systems. Fourth, an exploration of the globalisation of innovation systems is presented, focusing on the situation of Central and Eastern Europe, where the emergence of the global knowledge-based economy constitutes a specific challenge due to the persisting impact of the ongoing transformation process. Fifth, the conclusion summarises the most relevant policy implications for the support of Schumpeterian entrepreneurship during the transformation of innovation systems, as illustrated by the case of Poland.

Entrepreneurship in Schumpeter's Theory of Economic Development

The orientation of Schumpeterian and evolutionary economics with their theoretical focus on processes of change seems to provide most useful insights for the transformation in Central and Eastern Europe (van Zon 1994: 15). Therefore a first critical exposition of Schumpeter's approach may provide useful insights for further discussions. Schumpeter's theory of economic development distinguishes between economic growth and development. Economic growth denotes the slow, gradual and cumulative change of an economic system, resulting for instance from external factors such as population growth. Economic Development results from discontinuous internal changes by innovations, that is major changes which fuel structural change and business cycle fluctuations (Schumpeter 1939: 88n). Schumpeter presents basically a theory of the economic development of
modern capitalism, for the phenomena which shall be explained, that is, capital, credit, interest, entrepreneurial profit and business cycles, are portrayed as constitutive ingredients of modern capitalism. The historical phenomenon of modern capitalism is defined in institutional terms: 'capitalism is that form of private property economy in which innovations are carried out by means of borrowed money, which in general, though not by logical necessity, implies credit creation' (Schumpeter 1954: 223). This capitalist credit economy is characterised by specific social and institutional patterns. On the one hand, these are constituted by the capitalist civilisation, representing those institutional features which are essential characteristics of capitalism as an individual historical formation. Examples are the rationality related to the use of money as unit of account or the intellectual attitude of modern science (Schumpeter 1942: 121n). On the other hand, the typical features of modern capitalism are necessarily paralleled by pre-capitalist institutional elements and social strata. Actually existing capitalism appears as a symbiotic amalgamation of pre-capitalist and capitalist elements, for institutions do not only constrain the capitalist process, but also enable and support economic activities. Consequently the reproduction of modern capitalism in Schumpeterian terms is dependent from co-existing institutional patterns and social strata. Schumpeter's theory hence deleges a central role to the 'motive power' of the various types of economic actors and the subjective meaning of their actions (Rothschild 1980).

This is most obvious regarding the entrepreneurial type of actor who introduces novelty and thus keeps the capitalist growth engine in motion. The basis of Schumpeter's approach to entrepreneurship is constituted by the identification of particular functions and returns in the economic process. Entrepreneurs introduce novel combinations of productive means and by doing so upset the circular flow of economic life. Innovations in Schumpeter's terms are represented by the introduction of new goods, new qualities of goods, new methods of production, the opening of new markets, the use of new sources for the supply of inputs, as well as organisational changes within an industry (Schumpeter 1926: 216n). According to that schema, the entrepreneur sets up a new firm financed by the risk-taking capitalist's credit, proceeds with innovations, and receives an entrepreneurial profit which enables him to repay the credit. This points at the mechanism of economic development. In his first major volume Schumpeter already mentioned the aspect of 'effort' as a representation of these 'energetic' elements which represent the internal sources of economic dynamics (Schumpeter 1906b: 596). The entrepreneurial activity of introducing innovations enforces irreversible change, thus entrepreneurs need to break the resistance of the social and economic environment. The capabilities for leadership, combined with subjective will power, are individual qualities which enable an entrepreneur to overcome obstacles, to find strategic partners and to gain the acceptance of the consumers (Schumpeter 1926: 126n). The nexus between leadership and innovation is caused by the disruption of economic data which lose their guiding functions as devices for calculation and adaptation. Uncertainty dominates, as novelty and radical change decompose the role of experience and habits. Entrepreneurs therefore provide the economic actors with visionary ideas and guidance.

This corresponds with the distinction of various types of economic action, based upon spontaneous and creative versus adaptive behaviour (Schumpeter 1939: 119). According to Schumpeter the entrepreneurial function is characterised by the capability for creative response. In contrast to an adaptive attitude which denotes adaptations to gradual changes in the set of socio-economic data, creative response is neither predictable nor determinable: 'Whenever an economy or a sector of an economy adapts itself to a change in its data in the way that traditional theory describes, whenever, that is, an economy reacts to an increase in population by simply adding the new births and hands to the working force in the existing employment, or an industry reacts to a protective duty by expansion within its existing practice, we may speak of the development of an adaptive response. And whenever the economy or an industry or some firms in an industry do something else, something that is outside of the range of existing practice, we may speak of creative response' (Schumpeter 1947a: 150). The various modes of economic action according to Schumpeter are summarised in Table 1 below.

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<th>Schumpeterian Types of Economic Action</th>
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Schumpeter maintained that creative response counters the drive for a rationalisation of the capitalist process which may result in the bureaucratic lethargy of state-socialism. With creative response present, the future course of capitalist formations remains undetermined, for it can not be predicted as it creates novel situations which would never have been possible in its absence (Schumpeter 1947a: 150). Creative responses therefore characterise the quality of entrepreneurship as the most indispensable factor of economic development (Schumpeter 1947b: 8).

Each mode of economic action is driven by specific motives. It is crucial that Schumpeter's entrepreneur views profit not as ends in themselves but as means to achieve further ends, such as building a family-empire. Entrepreneurs are thus driven by motivations which are basically alien to the capitalist rationale. They are strangers in the value setting of capitalist rationality, for they strive for power and control and thus seem to follow a rather aristocratic ensemble of motives (Schumpeter 1942: 156n). It is noteworthy that Schumpeter attempted to trace these aristocratic motives of leadership and power also in the spheres of democratic politics and imperialism (Schumpeter 1942: 137n). In addition to the quite heroic individual entrepreneur, Schumpeter referred to Marx, Max Weber and Sombart and their unique vision of capitalist rationalisation and bureaucraticisation, as he pointed at the matter of industrial concentration and the increasingly dominant role of large corporations with their tendency of coping with innovations as professional routine procedures (Laville 1998). Influenced by the German Historical School he approached capitalism as a historical individual, that is, as an unique economic formation, that was to be analysed by differentiating several phases of development such as competitive and neo-mercantilist capitalism (Elster 2000). Each phase exhibits specific patterns of economic life, including, of course, diverse types of entrepreneurship such as the merchant and the corporate director who evolve from their specific social environment (Schumpeter 1928: 484n). Bureaucratisation does not necessarily put an end to the internal dynamics of late capitalism, for even employees in large corporations may act as entrepreneurs, exhibiting charismatic leadership only temporarily in the context of professional corporate tasks. Innovations become predictable and even the consumer get accustomed to the perpetual economic change. Thus the leadership function of entrepreneurship is increasingly obsolete, it becomes a mass phenomenon (Schumpeter 1942: 129n).

As Schumpeter emphasized functional aspects be suggested that entrepreneurship may also result from the intra-firm co-operation of the agents in various departments, for it is not ownership but the function of enforcing economic change by novelty which matters: 'Again the
entrepreneurial function may be and often is filled co-operatively. With the development of the largest-scale corporations this has evidently become of major importance: it is noteworthy that no single individual combines but has to be lifted into a corporate personality; on the other hand, the constituent personal characteristics must inevitably to some extent, and very often to a serious extent, interfere with each other. In many cases, therefore, it is difficult or even impossible to name an individual that acts as "the entrepreneur" in a concern" (Schumpeter 1935: 256). In accordance with these hints at the "corporate personality" as a collective entrepreneur, Schumpeter additionally put forward that even the state may act entrepreneurial: 'Every social environment has its own ways of filling the entrepreneurial function. For instance, the practice of farmers in this country has been revolutionised again and again by the introduction of methods worked out in the Department of Agriculture and by the Department of Agriculture's success in teaching these methods. In this case then it was the Department of Agriculture that acted as an entrepreneur' (Schumpeter 1935: 256).

This explains why Schumpeter pointed at the leading organs of a socialist community as well as at the chiefs of a primitive tribe as functionaries of change. The role of leadership coincides every social sphere, taking the shape of entrepreneurship in economic life (Schumpeter 1935: 111). He therefore commented on those approaches which went to replace the notion of entrepreneurial action by the impact of organisations and the whole of society; that they may be right in pointing at factors such as guilds, but that they underestimate the internal source of change, that is, entrepreneurial action (Schumpeter 1935: 229). The conclusion may be drawn that Schumpeterian entrepreneurship is not just simply a personal matter of embodied functions, but to a large extent also an institutional, structural and thus indeed a contextual matter, which is rooted in the historical diversity of various economic forms. The evolutionary content of that idea is obvious: 'Clearly, the corollary in human systems of the genetic diversity' underlying biological evolution is the existence of many different views and values. This will lead to diverse behaviours and explorations' (Allen 1988: 110). Schumpeterian and evolutionary approaches thus converge in the view that evolution is premised on different modes of behaviour, and that it is not the rationality of behaviour but its variety which supports the dynamics of modern economic life (Metcalfe 1988: 130). Schumpeter extended the range of entrepreneurship not only from the small business entrepreneur to the entrepreneurial agent in the large corporation, but additionally from the individual entrepreneur to the entrepreneurial-organisational interaction of various intra-firm agents, and even more than that, to the entrepreneurial function of the state. At this point the systems of innovation approach comes into play for it aims at the analysis of those institutional and organisational configurations which support the innovation performance of national or regional economies.

**Systems of Innovation between Globalisation and Transformation**

The emergence of the Schumpeterian renaissance in economics results from the structural crises of the so-called 'scientific-technical revolution' which hit both the capitalist and socialist economies in the 1970s and still fuels theoretical as well as policy concerns with unemployment, competitiveness and innovation. Schumpeter's theory provides the background for analysing the institutional determinants of growth and development, although the underestimation of demand side, user-needs and incremental innovations has been repeatedly critiqued. The systems of innovation approach takes these concerns as a starting point. A pioneering definition denotes a system of innovation in a broad sense as 'the network of institutions in the private and public sector whose activities and interactions initiate, import, modify and diffuse new technologies' (Freeman 1987: 1). More specific assumptions point at the role of knowledge and learning: 'First it is assumed that the most fundamental resource in the modern economy is knowledge and, accordingly, that the most important process is learning...Second it is assumed that learning is predominantly an interactive and, therefore, a socially embedded process which cannot be understood without taking into consideration its institutional and cultural context' (Lundvall 1992: 1). It follows that 'a system of innovation is constituted by elements and relationships which interact in the production, diffusion and use of new, economically useful, knowledge' (Lundvall 1992: 2). Objects of analysis are enterprises and other organisations which are embedded in institutional flows of knowledge and processes of learning, thus inter-firm co-operative relations, sectoral linkages, and R&D facilities are taken to the fore, accompanied by patterns of workforce training and education, investment patterns as well as legal frameworks. These topics are also explored in the context of neoclassical endogenous growth theories (Romer 1990). Still, under the common banner of Schumpeterian ideas, the systems of innovation approach resembles quite diverse theoretical traditions. In the following section the particular structuralist, evolutionary and neo-Schumpeterian research concepts shall be presented.

The structuralist strand is concerned with the role of industrial structures, linkages and inter-firm relations. It focuses on the notion of user-producer relationships as interactions between producers and users of certain technologies and products. User-producer relationships facilitate the communication of user needs and technological opportunities. They constitute the basis of interactive learning which is perceived as the major aspect of continual knowledge creation and diffusion as the area of product innovations (Lundvall 1992). Industrial structure and the institutional set-up then define the shape of an innovation system. Related to the matter of learning by interacting, the prominent role of industrial structures is due to the fact that the relation between production and learning resembles the Schumpeterian ideas of F. Perroux's structuralism which stresses the strategic importance of inter-firm and sectoral linkages for analysing economic growth, a perspective that has gained some additional prominence with A. Hirschman's elaborations (Andersen and Lundvall 1988). The conceptual proximity to the structuralist notion of 'national systems of production and consumption', perceived as systemic inter-firm linkages which proceed the flow of goods, knowledge, and information is reflected in the position that systems of innovation are well described as subsets of national production systems (Noss and Belka 1980).

An evolutionary vision of technological change is a commonly shared motive within the systems of innovation approach (Edquist 1997: 7). Explicitly evolutionary concepts draw from related theories of technological change which is then portrayed as a cumulative local phenomenon, that is, as an evolutionary process based upon the systemic introduction of novelty and the creation of diversity. This points at corporate search routines and the selective role of the market environment, accompanied by the likewise selective impact of the social context (McKelvey 1998). While the level of firms, branches and sectors provides the focal point of evolutionary analysis, additionally the role of institutions and organisations has been conceptualised with respect to the matter of variety. Moreover recent advances in evolutionary and systems theory have been applied to evolutionary technological innovations, as variety is portrayed as an indispensable feature of dynamic open systems in general (Saviotti 1996). Distinguishing the segments of output variety, process variety and institutional-organisational variety, it is maintained that an appropriate exploration of qualitative change in economic systems, such as the matter of technological change, needs to take into account diverse actors, activities and types of output which together constitute a particular system of innovation. The density and intensity of flows and interactions then define the structure and boundaries of the innovation system which is seemingly becoming a collective agent (Saviotti 1996: 180).
The neo-Schumpeterian research agenda is concerned with institutions and organisations as they are involved in technological innovation, business cycle fluctuations and structural change. In addition to firms, which constitute the primary arenas of technological learning, further components of an innovation system such as R&D facilities, education and training programmes or patent systems are analysed. Systems of innovation are then described as networks of innovation-related institutions and organisations, whose emergence is portrayed as a result of the historical evolution of capitalist economies, that is, as a result of the endogenous institutionalisation of science and technology in the socio-economic sphere. The neo-Schumpeterian notion of a system of innovation thus integrates the Schumpeterian types of inventor and innovator in a single systemic framework, for science-based industries constitute the functional core of an innovation system. This supports Schumpeter’s argument that it is not only technological but also social innovations that are the source of economic growth and development (Freeman 1987: 1). Systems of innovation reflect the institutional specificity of capitalism: ‘Technical innovation contributes to the everlasting uncertainty and evolutionary turmoil, which are so characteristic of capitalism. The growth of capitalist firms, industries and nations is not just a matter of the quantitative increase of inputs and outputs; ...; but of the qualitative transformation of the structure of the economy through successive waves of technical change’ (Freeman and Soete 1990: 31).

Another major Schumpeterian issue is taken to the fore by relating the institutional and organisational dimensions of innovations to the dynamics of a combined technological and institutional change as it is denoted by the concept of the ‘techno-economic paradigm’. Such a paradigm is defined as an ideal type of productive organisation, basically constituted by specific patterns of business organisation, radical and incremental innovations, innovator-entrepreneur types, as well as modes of investment, consumption and distribution (Freeman and Perez 1988). It is the most comprehensive type of innovation, accompanied by the sub-categories of technological systems as well as radical and incremental innovations which define the scope of technological and institutional change in the framework of a ruling paradigm. The corresponding long waves of economic activity that were the historical object of Schumpeter’s approach are an integral part of that analysis. A techno-economic paradigm emerges gradually, taking advantage of specific input factors of the production process. Its diffusion ensures a restructuring of the productive system which results in a mismatch with the institutional set-up. A temporarily stable reconfiguration may be established by the conflict-ridden adaptation of the institutional set-up to the requirements of the dominant paradigm. National systems of innovation provide those institutional and organisational means which are essential for coping with paradigm changes and thus for repeatedly defining a country’s position in the hierarchy of the global economy. The corresponding long wave dynamic is characterised by the technological leadership of those countries which are best equipped for meeting the techno-economic paradigm requirements, as paradigm configurations correspond with ideal typical ‘best practice’ innovation systems. Paradigm changes then allow for catching up, forging ahead or falling behind in the process of economic growth. Outstanding examples of this particular role of national innovation systems have been latecomer economies such as Germany and Japan (Freeman 1987).

The systems of innovation approach explores the institutions-organisations-technology nexus within various territorial settings, primarily within national economies but also in a regional or local context. This matter of the variety of forms and network patterns signals a major difficulty of the systems of innovation approach: the question of the boundaries of the system. A prominent method for delineating systems of innovation is provided by identifying the several links among the system units which facilitate the exchange of goods, information, knowledge and other resources (Niesel et al. 1998). In fact, these flows are of an increasingly supranational nature. Regarding the debates on internationalisation and globalisation, which are going to be explored more comprehensively in one of the following sections, a decreasing role of national specificities in the economic performance of firms and sectors has been envisaged, as national innovation systems seem to be increasingly replaced by regional or supranational interactions (Nelson and Rosenberg 1993). Rejecting these concerns, the alternative argument goes on to accentuate that basic differences in historical experience, language, and culture will be reflected in national idiocynocracies in the internal organisation of firms, the types of inter-firm relationships, the role of the public sector, the structure of financial institutions, and the nature, organisation and volume of research and development (Lundvall 1992: 13). Therefore it has been concluded: ‘As long as we can identify national cultures, we should expect national differences in production and innovation’ (Johnson 1982: 39). The resulting development patterns are accordingly stylised by the notion of national trajectories which complements the concept of techno-economic paradigms by stressing the institutional impact on shaping the actual form of a paradigm as it crystallises within national systems. ‘The conclusion is: “Technology like market processes, is not disembodied. It develops in communities; it has local roots. The processes of learning that drive its development are shaped by the community and institutional structure, and consequently the technological trajectories can only be defined in reference to particular societies”’ (Zysman 1994: 120).

By following the basic direction of Schumpeter’s arguments, which have been very much in favour of detailed comparative historical studies of institutional change, especially regarding the functions of entrepreneurs in the evolution of particular firms and industries (Schumpeter 1951), it may be suggested that institutional analyses do provide indispensable insights concerning the internal sources of change in economic systems. It follows that they support the analysis of the basic element of economic evolution: the element of entrepreneurial creative response. In order to proceed with an analysis of globalising national innovation systems, it needs to be examined what kind of entrepreneurial functions an innovation system may support. Taking Schumpeter’s theory of economic development seriously means to depict the functional relationship between innovation, invention and finance and to identify those actors within an innovation systems that are concerned with these functions. Thus the notion of ‘systemic entrepreneurship’ is introduced in the following section.

Innovation, Invention and Finance:
Approaching Systemic Entrepreneurship

The systems of innovation approach has been presented by its proponents as a conceptual extension of the Schumpeterian theory of entrepreneurship which is said to have been altered from a theory of the small business innovator to a theory of innovation in large corporations. Therefore the idea of transcending the original Schumpeterian perspective by moving from a rather individual towards a more collective perspective of entrepreneurship shall guide the systems of innovation agenda (Lundvall 1992: 80). Schumpeter, who allegedly neglected the role of demand and user-needs for innovations, is said to have also underestimated the different empirically most relevant types of innovations like gradual improvements of production processes and incremental product innovations (Freeman 1987). This criticism may hold some truth, although one might hint at the fact that Schumpeter was primarily interested in major economic change, thus he focused on clusters of innovations and long wave patterns.

What is the actual role of Schumpeterian entrepreneurship in the systems of innovation approach? How is entrepreneurship conceptualised? The systems of innovation approach reformulates the Schumpeterian scheme by integrating the functionaries of innovation within an interactive
system. Early formulations of the systems of innovation research programme emphasized that the analysis of innovation processes needs to transcend the Schumpeterian analysis of routine corporate innovations, for the ‘organized entrepreneurs are functioning in the context of a system of innovation where new processes and products are the rule rather than the exception’ (Andersen and Lundvall 1988: 14). Moreover, it has been suggested: ‘In order to explore this notion of systems of innovation we shall leave the actor-oriented approach of neoclassical as well as (most of) evolutionary theory. Instead we shall concentrate on certain aspects of the structural determinants of innovative activities’ (Andersen and Lundvall 1988: 15). Hence a most important element of the particular innovation systems were the various modes of interaction among individual and collective agents (Edquist 1997). Regarding Schumpeter’s position on co-operation and innovation, it is quite interesting to note that the idea of a collective entrepreneurship, based upon elements such as trust, interaction and co-operation, has been put forward as follows: ‘The incentives for communication and cooperation between departments within firms, between firms in industrial networks, and between firms and government agencies are important aspects of the incentives for collective entrepreneurship’ (Edquist and Johnson 1997: 515). This notion of a ‘collective entrepreneurship’ still accounts for individual action, that is, the collective does not represent a substitute but a rather normative concept of innovation as an embedded group effort within and among firms. It is a significant question which institutional configurations and incentives enable the agents within an innovation system to fulfill the entrepreneurial function of creative response.

Before the matter of a ‘systemic entrepreneurship’ shall be discussed, it needs to be clarified what extent a systemic perspective accounts for the matter of individual action, for it is not the system but the actor within the system who proceeds with entrepreneurial action. Therefore it will be useful to review different approaches to entrepreneurship, especially the Austrian School has contributed influential elaborations in the tradition of Mises, Hayek and Kirzner. The most fundamental differences between the Schumpeterian and the Kirznerian entrepreneur lie in the equilibrating function of the latter; for he or she is basically concerned with processes of discovery and learning in the Hayekian context of an economy due to asymmetrical information and tacit knowledge. Entrepreneurial ‘alertness’ then leads to the realisation of an arbitrage, that is, to an exploitation of the related profitable opportunities which only the entrepreneur is able to identify and to realise. At least on the surface, the Kirznerian entrepreneur comes close to Schumpeter’s type, for, according to Kirzner, his typical alertness represents the entrepreneurial element in decision-making: ‘It is this entrepreneurial element that is responsible for our understanding of human action as active, creative, and human rather than as passive, automatic, and mechanical’ (Kirzner 1979: 63). In addition to the matter of discovery and equilibrium versus creativity and evolution it is the role of the institutional context which distinguishes Schumpeter’s approach from Kirzner’s subjectivism. It is the accentuation of the tacit dimension of knowledge as well as the aspect of treating institutions as transmitters of knowledge and information, both aspects are to be found in Hayek and Kirzner, which provides the systems of innovation approach with an implicit Austrian flavour. Still this is overshadowed by the prominent use of institutionalist Weberian arguments. Consequently the current debates on systems of innovation seem to represent the concerns of the original Schumpeterian approach to production, innovation and economic development in more appropriate terms than the exchange oriented Austrian discourse.

In order to proceed with the analysis of entrepreneurship in systems of innovation, the notion of ‘systemic entrepreneurship’ shall not suggest that the system is acting or that it represents a consciously designed and smoothly working entity. Actually it corresponds with the definition of such a system as ‘a set of institutional actors that, together, plays the major role in influencing innovative performance’ (Nelson and Rosenberg 1993: 46). According to Schumpeter’s theory of economic development, the following types of economic functions may be distinguished. First, the entrepreneurial function of introducing novelty and enforcing change. Second, the capitalist function of credit creation and risk-taking. Third, the function of the inventor, who provides the economic system with a continuous flow of new knowledge Schumpeter 1929: 117). Systemic entrepreneurship points at those actors and their organisations, that take up the function of Schumpeterian entrepreneurship within a system of innovation, interacting with the actors of the financial and the inventive functions. Systems of innovation may integrate all these Schumpeterian functions in a single systemic framework. Indeed, the aspect of financing innovations and its selective role has often been neglected, although it constitutes a core relation in the actual innovation process (Christensen 1992).

The function of the inventor points at R&D activities and related facilities for the creation and diffusion of knowledge in the education and training system, but also at shop-floor improvements. The capitalist function is represented by the systems of banking and finance. It mirrors the modes of financing innovations and thus coping with uncertainty, that is, risk-management in an innovation system and its articulation in the area of finance. The entrepreneurial function of a commercial introduction of innovations and of enforcing economic change denotes the corresponding actors within firms and related organisations, including the state, depending on the institutional context. The interactive relations among the various actors which constitute the effect of systemic entrepreneurship in an innovation system are depicted in figure 1 below.

![Fig. 1 Systemic Entrepreneurship in Systems of Innovation](image-url)

The institutional framework of these interactions determines the level of transaction costs and thus the intensity of cooperation, the modes of learning as well as the resulting innovation performance. This is basically due to the reduction of uncertainty, the regulation and moderation of conflict as well as the provision of incentives for entrepreneurial action (Edquist and Johnson 1997: 515). This systemic integration of science, technology, production and finance with the dispersed entrepreneurial agents within an innovation system constitutes that element of internal change which is mirrored by the patterns of creative or adaptive response. With regard to these patterns and the corresponding type of systemic entrepreneurship, creative or adaptive systems of innovation may be distinguished. According to the neo-Schumpeterian approach, economies cope with a technoeconomic paradigm on the basis of the possession of natural resources plus social, cultural and political factors (Freeman and Perez 1988). Systemic entrepreneurship then plays a crucial role for the specific mode according to which the actors within a system of innovation
cope with a techno-economic paradigm. On the one hand, they may respond by an adaptation to the recognised paradigm requirements within the parameters of existing practice, thus exhibiting an adaptive response. On the other hand, creative response may lead to a complete change in economic and social routines as well as to changes of the paradigm itself.

The systems of innovation approach asks: 'Why do some countries catch up rapidly at some periods and others more slowly or not at all?' (Freeman 1985: 23). In this context, the factors of systemic entrepreneurship, that is, the dimensions of knowledge creation in research, education and production, the matter of risk management in the financial sector as well as the realisation and diffusion of innovations by the various entrepreneurial agents have been explored, for instance by contrasting Anglo-Saxon 'public' and German-Japanese 'intimate' types of national innovation systems (Patel and Pavitt 1986). Basic differences in the institutional set-up of the types determine the economic performance of the related economies. From a Schumpeterian view the question needs to be posed whether the current process of internationalisation and globalisation then leads to the transformation or complete fragmentation of innovation systems and the corresponding pattern of systemic entrepreneurship.

Globalisation, Transformation and the Reconstruction of Innovation Systems

The current structural transformation of global capitalism is marked by the emergence of new key technologies, the internationalisation of production and distribution as well as changes of the policy role and competences of nation-states. The popular term 'economic globalisation' exhibits a highly ideological and particularly distorting character which does not allow for the fact that the current phase of capitalist development is not marked by an equal opportunity access to the international flow of resources, but by uneven development, distributive inequality and, as far as the major flows of goods, services and investment capital are concerned, a "triatisation" of the world economy with Europe, Northern America and East Asia as metropolitan core areas (Hirst and Thompson 1996). In order to grasp the nature of the current transformation and restructuring processes which mark the international economic terrain it shall be useful to differentiate between the integrated segments of economic, institutional and spatial factors of change (Hausner et al. 1997).

Multinational corporations have emerged as the decisive carriers of international trade and direct investment flows (Dunning 1988). Thus it has been suggested that the question 'who is us' is not to be answered in terms of national ownership categories anymore. Instead the attraction of high value-added employment within the production and service networks of multinational corporations shall evolve as a major motive for economic policies (Reich 1991). Efforts in setting up an effective locational policy are accompanied by the support of localised technological innovations. Due to that locational competition, firms and states meet on the grounds of bargaining relations and a related triangular diplomacy' that is based upon comparative bargaining advantages. This mutual bargaining mechanism shapes the relations between governments, basically MNC host governments, and multinational corporations, which are coined by the simultaneity of conflict, competition and co-operation (Stepford and Strange 1991). While these approaches put the conceptual emphasis on the attraction of high value added segments of multinational value chains, others have put their emphasis on the role of 'home base' policy support for MNCs (Porter 1990). The related transformation of state functions is marked by the emergence of the dominant pattern of a 'Schumpeterian welfare state', which acts as a sequel to the Keynesian welfare state, for it initiates a search for technological and structural competitiveness which is generally served by pursuing the policy project of economic restructuring (Jessop 1984a).

In addition to these economic and political changes it has been remarked that economic globalisation leads to a reconfiguration of the spatial structure of global capitalism, which is characterised by the rise of post-fordist systems of production, representing the drive for a territorial specialisation concerning high-skill and knowledge-intensive economic activities. These production systems have been analysed from a perspective which assumes that globalisation reinforces local communities and agglomerations which shall derive their relative strength from embedded learning capabilities, marked by untraded interdependencies such as historically rooted conventions (Scott and Storper 1995). In a slightly different version, the creation of regional competitiveness is said to result from advantages in the areas of manufacturing, services, human capital, infrastructures, financial systems and industrial governance. The locational policy rationale of 'learning regions' is accordingly coined by efforts to build spillage spillages between local authorities and transnational capital, emphasizing the meso-economic level of interaction (de la Mothe and Puquet 1996). Approaches which have propagated the idea of a re-emergence of regional economies have been criticised for a perspective which seems to view globalisation as a subordinated facet of regionalisation, that is as 'a nascent of local industrial complexes' (Amin 1994: 28). Understanding globalisation thus requires to put the analytical emphasis on the dominance of multinational enterprises and their networks of production, distribution and finance which contribute to the centralisation of high value-added economic activities within 'neo-Marshallian network nodes' (Amin and Thrift 1992). Rather than offering opportunities for an endogenous and sustainable development of regional economies with their specific economic and social networks, globalisation may be viewed as a process of disintegrating and disembodiment of regional linkages (Amin 1999). The logic of business networks thus constrains national, regional or local policy initiatives, for the potential of a wealth creating participation in these networks is conditioned by the question of who is granted access and who not.

It is decisive that an increasing openness and intensified 'smallness' has become typical for all economies whose structural competitiveness is based upon the constructed advantage of technological capabilities. This tendency is well reflected by the internationalisation of national innovation systems, as exemplified by the development of R&D activities. Inter-firm R&D collaborations and international industry-academic research collaborations result in the combination of organisational decentralisation and spatial centralisation. Global corporate innovation networks thus encompass a broad range of functions ranging from market oriented product development to research units which tap technologies and academic centers of excellence (Granstrand et al. 1998). Consequently it has been suggested that national systems of innovation are still essential domains of analysis, while they are framed by co-existing local, regional, supranational or sectoral segments of innovation systems (Freeman 1986). Furthermore national systems of innovation are not generally deconstructed by economic globalisation, as they may become subject to the exploitative efforts of corporate agents (Chesnais 1991). These efforts may contribute to the building of innovation systems, for multinationals find it is indeed promising to invest in areas such as capacity and manpower training (Chesnais 1992). This hints at the transformation and reconfiguration of innovation systems which is not only characterised by international openness, but also by a drive towards commercialisation and market orientation. Next to efforts concerning international linkages among different innovation system components, the increasing importance of market-oriented technological and 'soft' infrastructures has been observed. Universities, for instance, exhibit a general trend towards mission-oriented research and service-oriented interactions with the business sector by establishing interface units and joint research facilities (Galli and Tesfai...
The current transformation of the post-socialist systems of innovation may be interpreted as a transformation of techno-economic networks, that is, a transformation of those institutional networks in an innovation system which are involved in the innovation process of specific technologies (Radosevic 1997: 371). Here the notion of systemic entrepreneurship may prove its usefulness. That transformation is basically constituted by the 'entrepreneurialisation' of the firm, strengthening strategic competencies and reconstituting the institutional networks. The orientation towards the market demand and the recognition of user-needs is accompanied by the formation of business networks and groups as heirs to the former combines. This may have a positive impact on the innovation systems due to a possible articulation of advanced R&D demand and coherent corporate restructuring. Still, it could also turn to static rent-seeking behaviour and thus block an innovation-based development path (Radosevic 1995: 380n). Furthermore, the opening of the post-socialist systems of innovation to a globalising world economy with its flows of foreign direct investment is an uneven process which may lead to negative consequences like a structural fragmentation as well as to a positive outcome such as comprehensive knowledge transfers and sustained technological learning (Radosevic 1997: 384n). If one accepts the assumption that the dichotomy of market versus plan denotes not the decisive difference between capitalism and socialism, but rather the existence of capital markets, then it becomes obvious that the reconstruction of the finance-innovation nexus constitutes a major problem of the transformation processes, with consequences at least as severe as the restructuring of the complete science and technology system. Moreover, the reconstruction of research funding highlights the major implications of that aspect. Policy initiatives thus need to take into account this aspect of systemic entrepreneurship which is often neglected in the discourse on the globalisation and transformation of innovation systems in the emerging knowledge-based economy.

Policies for the Support of Schumpeterian Entrepreneurship

The notion of path dependent change in the transformation process describes an institutional reconfiguration rather than a complete replacement of institutional patterns (van Zon 1994: 6r). Indeed every rational or regional system of innovation is historically rooted in diverse institutional and structural configurations which persistently mark the entrepreneurial behaviour as well as the innovation performance of the economic actors (Elms 1989). That kind of historical interdependence of institutions, organisational and technologies contrasts with the technocratic view of the transition to the market, for simplifying the rules of the game in the domains of ownership structure and economic restructuring, and the regimes of price system and foreign trade shall result in a big push towards market competition (van Zon 1994: 49). With regard to transformation policies, the limits to the political influence on economic and social processes becomes visible, as these policies face the inertia of values and belief systems as well as the negotiated bargaining character of consensus-building, thus 'governments have to dance with chains on their ankles' (van Zon 1995: 11n). Networks of economic actors which constitute an innovation system exhibit properties that facilitate the reproduction of entrepreneurial activities beyond the impact of individual personalities, as particularly portrayed by Schumpeter (Grabher and Stark 1997: 3 and 13). The corresponding thesis regarding the transformation of the business networks maintains that institutional legacies of the socialist era coin entrepreneurial activities in the post-socialist systems, due to the structural continuity of the elite and the links between entrepreneurship, education and post-socialist economic life (Grabher and Stark 1997: 9). Although this position confines the notion of Schumpeterian entrepreneurship with some ideas of management functions and routine business, it should be realised nevertheless that behaviour...
and motives of the economic actors are biased by historical influences which might obstruct entrepreneurial initiatives.

The case of Poland may provide further insights for the discussion of policies which take into account the economic function of Schumpeterian entrepreneurship. Since 1988 the Polish reform process was an attempt to strengthen the entrepreneurial elements. Decentralisation and indicative planning were emphasized while enterprises should receive the status of responsible ‘profit centres’ (Michnowski 1975: 80n). This was accompanied by a concentration strategy which led to the formation of the ‘large economic organisations’, the Wielka Organizacja Gospodarcza or WOG, which were explicitly designed to allow for participating in the ‘scientific-technical revolution’ by an integration of production, finance and research (Michnowski 1976: 85). While that strategy failed, the scientific R&D infrastructure in Poland still seems to be well-developed in quantitative terms. It is constituted by university institutes, institutes of the state and the Polish Academy of Sciences, public and private R&D laboratories as well as in-house R&D facilities. With regard to the distribution of R&D manpower between firms and non-business organisations, the bias is towards the latter, indicating a structural weakness of in-house R&D in Polish industry which results in underdeveloped linkages between science, R&D and industrial practices. This situation is even made worse by the fact that the industrial R&D activities are concentrated in the most traditional and outdated branches of heavy industry (Karpinsky 1995: 131n). This corresponds with a relatively low level of R&D expenditures in electronics and high-technology industries (Karpinsky 1995: 135n). Actually these are the industries which combine science and knowledge intensity with a key role in the current techno-economic paradigm.

The solution of supporting the remaining Polish high-technology industries by protective measures and appropriation incentives, among others, has been proposed quite recently (Karpinsky 1995: 144n). The dramatic situation notwithstanding this seems to be a misguided idea, not at least due to the weak human capital endowment and knowledge-base of the Polish economy, which is most visible regarding the comparatively low shares of the population with high school education and a likewise low school attendance rate, as compared with the EU countries (Maroty 1998: 168n and 172n). In fact, more comprehensive policies are necessary which allow for the strategic moderation of systemic interdependencies. In accordance with that suggestion, Polish policy-makers seem to show a growing interest in regional policies, with the common agenda of innovation networks, technology transfer programmes and manpower formation, accompanied by the gradual re-emergence of historical regions and cities (Jessep 1994c: 68). Regional development strategies in post-socialist economies should indeed focus on public-private partnerships and regional networks which mobilize the local endogenous potential, including financial resources (Jessep 1994b: 66). This kind of technology and industrial policy might result in preserving the critical degree of institutional variety which would be in accordance with the thesis that an institutional homogenisation leads to short-run adaptations at the cost of weakening the long-run adaptability (Grabher and Stark 1997: 1n). Moreover, the changing knowledge-base of the transformation economies needs to be taken into account. This affects the institutional and organizational pattern of R&D activities, among others including a shift of demand as well as changes in the modes of public funding and private supply (Radosevic 1997: 381n). Knowledge as a semi-public good needs to be viewed as a specific resource which should not be subject to a complete privatization of its generation and diffusion. Instead it should be built upon combined private-public capabilities and the formation of mediating organisations (Radosevic 1997: 381n).

With regard to the fact that the systems of innovation approach focused on East Asia as an example of successful catch-up growth, the discussion on the transformation of the Central and Eastern European economies may be compared with critical findings on the East Asian economic development paths, even before the ‘Asian Crisis’ struck. The systems of innovation approach suggests that the catch-up growth of the East Asian economies owes much of its success to the favourable national systems of innovation of that region, that is, to a common East Asian type of innovation systems which features educational policies that were pursued under the primacy of economic and technological requirements. The most prominent components of the East Asian model of innovation systems have been summarised as follows (Freeman 1996: 178). The expanding education system with an emphasis on tertiary education and engineering has been accompanied by the rapid growth of business in-house R&D, a share of industrial R&D above 50 per cent of all R&D-expenditures, and the development of efficient science and technology infrastructures, with parallel heavy investments in advanced telecommunications. The corresponding growth of export oriented electronic industries enabled the local firms to participate in international technology networks. In spite of the diverse structural and institutional patterns of the national systems of production and innovation, a common motive of East Asian industrial policies lies in supporting the impact of technological learning and innovation on the growth of per capita GDP (Masuyama 1997). A most interesting aspect, then, is the question for the character of technological innovations in East Asia and thus for the matter of adaptive versus creative responses. It has been accentuated that an adaptive pattern prevails: ‘Innovation in East Asia makes no emotional or ideological distinction between innovation and imitation. The patterns of imitation demonstrate corporate creativity and result in competitive advantage, bringing about industrial transformation and development’ (Hodoy 1995: 194). The East Asian economies do not provide a showcase for the theory of technological ‘leapfrogging’, but rather for a process of continual learning. The corresponding type of economic growth and development is in need of further impulses, basically regarding R&D activities and product innovation capabilities, which might transform the East Asian trajectory of imitation-based growth into a more self-sustained growth mode that approaches the technological frontier (Hodoy 1995: 209n).

The implications for the Central and Eastern European economies should be clear: The level of R&D expenditures does not determine the capability for innovation, for this is embedded in an institutional, structural and spatial context which provides the impulses for entrepreneurial action. The situation of a comparatively low share of innovative Central and Eastern European enterprises and the additional paradox of a declining share of innovative enterprises in Poland points at major structural problems of the post-socialist economies (Radosevic 1995: 40n). The purposeful design of an innovation system is not feasible, for any kind of design strategy will be limited by unintended consequences and externalities. Moreover there is no linear relation between the structural and institutional features of a national innovation system and the actual economic performance (Edquist 1997). Still, a systemic policy approach which stimulates the entrepreneurial function in systems of innovation by addressing the matter of finance as well as human capital, knowledge and learning capabilities should lead to positive results. It follows from the Schumpeterian logic that entrepreneurial functions can be fulfilled only temporarily. Sound policies for the support of industrial innovation will have to account for that aspect which highlights the opportunities and limits of policy-making.

Conclusion

This paper has elaborated on the Schumpeterian notion of creative response which represents the decisive internal factor of innovation and economic change. It has been emphasized that the entrepreneurial function of creative response is not necessarily fulfilled by single persons or by the leading personnel of a firm, for even modes of intra-firm co-operation and public policies may exhibit entrepreneurial functions. This matter has been related with the systems of
innovation approach, as the notion of systemic entrepreneurship denotes the interaction of the sectors of science, technology, production and finance within an innovation system, embedding the entrepreneurial actors. The necessity of holistic and systemic analyses of transforming economic systems is a difficult task, just like the analysis of emerging modern capitalism in Europe during the late middle ages (van Zanden 1994: 19). In this context the notion of Schumpeterian entrepreneurship proves its usefulness due to the inherent historical implications of Schumpeter's theory which aimed originally at the explanation of the long-run socio-cultural development of nations and civilizations. That kind of historical perspective allows for the differentiation between aspects of continuity and change, and thus for an attempt to picture the variety of institutional, organizations and technologies within an economic formation. Thus particular ‘economic styles’ are viewed as determining factors of the performance of innovation systems (Shneider 1999). Consequently, historical path dependence, entrepreneurial intervention and economic development complement each other, resulting in an interplay of history and evolution.

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