Can the National Innovation Systems of the New EU Member States Be Improved?

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Abstract

This article outlines the main directions of the development of national innovation systems in the new EU member states as catch-up economies emerging from a period of systemic change. Attempts simply to copy the experience of the high-income economies in building national innovation systems are misconceived. That experience needs to be adapted to the specific conditions of catch-up countries with a unique systemic heritage. The dominant linear innovation model should be replaced as a basis for thinking and policy making by an interactive, learning-based approach. Catch-up economies such as these need to improve significantly their levels of innovation diffusion management and networking. A symbiotic approach to the balance of high- and low-tech industries is needed. Managerial and organisational competence is at least as important as technological competence.

After going through a painful process of restructuring in the 1990s the transition countries have now reached the catch-up stage of economic development. Thus, for example, the real income level per capita in Estonia compared with the EU-15 average increased from 31% in 1995 to 50% in 2005 (Varblane & Vahter 2006). Currently the main driver of the catch-up process is still relatively low production costs. It is widely accepted, however, that sustained economic development depends on the technical and organisational changes brought about by continued processes of innovation (see e.g. UNIDO 2005). As the transition countries move up the development ladder and undertake more complex activities, they will need to upgrade their technological capabilities and undertake more advanced forms of innovation.

It is against that background that the systemic approach to the management of innovation processes and the concept of national innovation system has moved into the centre of policy making in the new EU member states. Sometimes, however, policy...
makers have underestimated the difficulties in transplanting the innovation system concept to emerging countries without adapting it to the local economic, social, cultural and other frameworks. In the case of new EU member states there exists a common element of path dependency — these countries have passed through a common process of systemic change, and policy making must take into consideration the influence of the former command economy system. At the same time, the new EU member states are latecomers, so that they are able to benefit from using innovations developed by leading industrialised countries. The present article seeks to analyse the specific features of the process of implementation of the national innovation system concept in the new EU member states in terms of catch-up economies coming out of a period of systemic change. The next section traces the development of the concept of the national innovation system, its elements and functioning. The third section is devoted to the implementation of the national innovation system approach in different groups of countries. The fourth section looks at the catch-up economies in terms of latecomer theory. The specific problems of building up national innovation systems in such catch-up economies are addressed in the fifth section. The concluding section summarises the findings of the article and presents recommendations.

The Development of the Concept of Innovation System

The British economist Christopher Freeman was the first to use the term ‘national system of innovation’, in 1982 (Freeman 1982; Carlsson 2003), and rather similar ideas were developed by Lundvall in Denmark in 1985. The common denominator between the two was the understanding that the innovation process should be treated in a systemic manner. As Lundvall recalls: ‘It seemed obvious that most of the new knowledge needed for innovation did not come directly from universities and technical research and in many industries not even from research and experimental development but rather from other sources like production engineers, customers, marketing etc. The problem was to integrate these broader contributions into a concept of the innovation process’ (Lundvall et al. 2002, p. 215). Based on those principles, Lundvall (1992, p. 12) defined an innovation system as ‘the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge’.

Those findings were further developed and supported by the results of various empirical studies. A research group headed by the US economist Richard Nelson (1993) compared the national innovation systems of 15 countries, finding that the differences between them reflected different institutional arrangements, including systems of university research and training and industrial R&D, financial institutions, management skills, public infrastructure, and national monetary, fiscal and trade policies. By the late 1990s the OECD had initiated a broad comparative cross-country study of national innovation systems (OECD 1997, 2002). This study provided support for the ideas of Edquist (2001) and Metcalf (1998), which tended to place the concept of national innovation system in a comparative perspective. The implication is that there cannot be one ideal national innovation system that fits different nations with specific socioeconomic, political and cultural backgrounds.

In discussing the concept of the innovation system, it is important to keep in mind that originally Lundvall distinguished between narrow and broad definitions of an innovation system. The narrow definition covers only ‘organisations and institutions involved in searching and exploring — such as R&D departments, technological
institutes and universities’. The broad definition covers ‘parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and adapting’ (Lundvall 1992, p.12). Thus innovation performance is influenced by the knowledge infrastructure, institutions, demand and supply etc. In the broad interpretation of the concept of the national system of innovation, innovation is seen as a continuous nonlinear cumulative process involving not only radical and incremental innovation but also the diffusion, absorption and use of innovation. The dynamic properties of the system — robustness, flexibility, ability to generate change and respond to changes in the environment — are also listed among its most important attributes (Johnson et al. 2003).

The idea of a systemic approach to the study of the innovation process gained rapid acceptance among scholars. It was quickly understood that the innovation system concept need not be restricted to national entities, and several complementary approaches were subsequently developed, including regional, sectoral and technological innovation systems. The ‘technological systems approach’, focusing on innovations in particular techno-economic areas, was worked out in Sweden by the working group headed by Carlsson (Carlsson & Stankiewicz 1991; Carlsson 1995, 1997). The notion of ‘sectoral systems of innovation’ was launched in 1997 (Breschi & Malerba 1997). At the same time the concept of regional innovation systems was developed in a bid to emphasise the importance of regions in the process of innovation (Cooke 1992, 1996). To sum up, the innovation systems concept has created an impressive stock of research, with approximately 1,000 related publications (see overview in Carlsson 2003).

Innovation systems work through the introduction of knowledge into the economy, which requires active learning by all actors in the innovation system. Lundvall (1988, p.362) notes the key role of learning in binding together production and innovation in the national system of innovation and as the promoter of dynamism in the system, and (Lundvall 1992, 2003; Lundvall et al. 2002) sees the national system of innovation as the learning system of the economy. The efficiency of these learning activities, and hence the performance of the innovation system, depends on economic, political and social infrastructures and institutions (in Abramovitz’s terms ‘social capability’ — see discussion below). But in the national innovation system framework, institutions are not organisations; rather they are understood as the rules of the game. The organisations are the actors that interact. From this perspective, innovation is a matter of interactive learning (Edquist et al. 1998). It also depends on past experience (path dependency or lock-in) as reflected in the tangible and intangible aspects of the structure of production and in values and policies.

Advantages and Disadvantages of Coming Late

Among the first systematic attempts to analyse the catch-up process was the work of Gerschenkron (1962) on the development of the German and Russian steel industries in the late nineteenth century. He argued that latecomer firms had several advantages vis-à-vis firms from the frontrunning countries. They could acquire and use modern technology at much lower cost than the latter through technology transfer agreements (licences etc.), inward investment and the recruitment of skilled people. Furthermore catch-up firms and countries do not have to face all the uncertainties, costs and difficulties of opening up entirely new markets, because world markets in the given sectors have already been created by the leading firms and countries (see detailed analysis in Freeman 2002).
Bell & Pavitt (1997) pointed out weaknesses in Gerschenkron’s catch-up theory. It is not sufficient for the catching-up country simply to install large plants with foreign technology — the capacity to absorb the new technology into the human capital stock is also critical. That requires wide implementation of active learning policies (see below). Thus Bell & Pavitt brought in a wider perspective — that latecomers also need a properly working innovation system, though of a distinctive kind.

Gerschenkron’s theory of latecomer advantages was further developed by Abramovitz (1994). He accepted the potential for catch-up by latecomers but suggested that exploitation of the potential was not an automatic process. He proposed that differences in countries’ abilities to exploit this potential might be explained with the help of two concepts: technological congruence and social capability. Under the first concept he understood the degree to which the characteristics of leader and follower country are congruent in areas such as market size, factor supply etc. The second concept refers to variables like education and the business infrastructure (see discussion in UNIDO 2005). A widely accepted concept in the literature in this context is ‘absorptive capacity’, defined as 'the ability of a firm to recognise the value of new, external information, assimilate it and apply it to commercial ends' (Cohen & Levinthal 1990, p. 128).

Freeman (1999) linked the findings of Abramovitz on technological congruence and social capability with the capacity to make institutional changes. Thus many East Asian countries have succeeded in introducing the institutional mechanisms required to bridge the ‘learning divide’ or the ‘technological divide’ (Arocena & Sutz 2003). Freeman expressed the idea in the following words:

The huge divergence in growth rates which is so obvious a feature of long-term economic growth over the past two centuries must be attributed in large measure to the presence or absence of social capability for institutional change, and especially for those types of institutional change which facilitate and stimulate a high rate of technical change, i.e. innovation systems. (Freeman 1999, p. 110)

Several authors have also pointed to the importance of geographical and cultural proximity to leading technology nations for a successful catching-up process. Freeman (2002) gives the example of how Britain was overtaken by neighbouring European countries and overseas countries with British and other European immigrants. The most successful catch-up countries in East Asia have been geographically, and to some degree culturally, close to Japan, which has played a key role as the source of innovation diffusion to those economies.

Perez & Soete (1988) have suggested that latecomers may also suffer from some potential disadvantages. They convincingly showed that scale economies were industry-specific and technology-specific. In many industries scale economies in design and product development are actually much more important than scale economies in production. Perez & Soete further stress that effective catch-up in technology requires a science and technology infrastructure, and that the costs of imitation can be rather high in the absence of such infrastructure.

Nevertheless, Gerschenkron’s main idea — on the scope for imitation as a major latecomer advantage — must be treated as a key building block for innovation systems for catch-up economies. In most cases imitation is easier and less costly than innovation. A very large technology gap does provide the potential for a rapid catch-up process. But it is only a potential. The latecomer economies that have succeeded in catching up are those that created a wide-ranging process of diffusion of innovations (UNIDO 2005).
The experience of some East Asian countries has clearly shown the importance of technology diffusion management. Two major directions of technology diffusion are through market-induced imitation and organisationally induced technology transfer. But as Matthews (1999) shows, such a framework fails to fit the reality of the achievements of East Asian latecomer firms that have integrated into the high-technology industries. Instead of passive diffusion, they have implemented an active model of technology diffusion management which has leveraged those innovations and turned them into technological capabilities and competitive products very quickly. East Asian innovation systems have been particularly strong in building the institutions needed for latecomer economies lacking resources and advantages other than temporary cost advantages. They have aimed to identify the resources that are most abundantly available, and most susceptible to leverage. Instead of establishing R&D support institutions typically suggested by the experience of high-income economies, they developed whole networks of institutions for technology diffusion and the management of organisational capabilities.

Yet the EU catch-up economies cannot simply copy the experience of the East Asian latecomers. Over recent decades, as demonstrated by Fagerberg & Godinho (2005, p.535), the conditions for catching up have become more demanding in relation to technological congruence. Fagerberg shows how radical new developments in technology impose a requirement for much higher levels of absorptive capacity from catching-up economies.

Applicability of the National Innovation System Approach to Developing and Catch-up Economies

The innovation system approach was developed on the basis of the experience of high-income societies, with a strong knowledge base, a well-functioning market system and developed institutional and infrastructural support for innovation activities. More specifically, the innovation system model was worked out for countries developing under conditions of moderate growth. The situation of the catch-up economies is rather different. They have much lower income levels and less accumulated knowledge. At the same time, they are extremely dynamic, which imposes special requirements on the innovation system. Furthermore, foreign direct investment plays a much more important role in contemporary catch-up countries than it has ever done in the rich industrialised countries where the national innovation system concept was developed. Thus in the present context the relationship between globalised and national/local systems needs to be examined carefully. Taking all things into account, and following the whole logic of the innovation systems approach, it is clearly not possible automatically to transplant an innovation system concept worked out on the basis of the technological frontier countries of Scandinavia or the UK to the catch-up economies of Europe or South-East Asia.

Gregersen & Johnson (2001) and Johnson et al. (2003) proposed that, when the national system of innovation concept is applied to the developing countries, the focus ought to be shifted in the direction of system construction and system promotion. In practice, however, the majority of applications of the innovation system framework to developing countries attempt to transpose a well-functioning innovation system model based on developed countries directly to developing countries (see discussion in Arocena & Sutz 2003), ignoring the specificity of the local institutional context and its inadequacy in fostering learning and innovativeness in firms (Parto et al. 2005).
A striking example of such specificity is *institutions acting as obstacles to innovation*. Little discussed in the literature, this is commonly the case in the new EU member states. Thus, for example, in the Academies of Sciences and research institutes of those countries:

The notion of ‘big science’ still survives, locking scientists and science administrators into a crude science-push mind-set, and reinforcing disciplinary conservatism. This kind of thinking ... is pernicious because it stops transition countries’ R&D sectors, and in particular the basic science sub-sectors, from evolving in a way that would support the general work of restructuring the economy so as effectively to exploit the human capital resources of the region. Perhaps most important, it prevents the emergence of integrated systems of higher education and research such as are generally recognised in the advanced countries to be the most effective way of producing good research and good graduate students (Dyker 2006a, pp. 12–13)

What is clearly required in these countries is *adaptation* of the innovation system approach to the local situation, rather than unreflective copying. The creation of an institutional framework means that firms do not have to leverage and learn on their own, and that the results of earlier experiences with collaborative dissemination can be used to improve outcomes. Matthews (1999) and Viotti (2002) described the institutional framework in successful East Asian and Latin American countries respectively as ‘national systems of learning’. In catching-up processes, the key issue is the use made of newer technologies rather than the generation of those technologies themselves.

In this context, Viotti (2002) elaborates a contrast between ‘passive learning systems’ in developing countries such as Brazil, which involve the absorption of production capability, with ‘active learning systems’ that combine this with what he terms ‘improvement capability’ (see also Bell & Pavitt 1997). Improvement capability involves the mastering of product and/or process technology, without necessarily becoming a leading innovator in the field. Possible aspects of improvement capability include (in roughly ascending order): major adaptations to local conditions, shop-floor experimentation, preventive maintenance, networking with suppliers and customers, total quality systems, permanent training, product/process improvement, equipment stretching and adaptation, regular search for outside knowledge and skills, science and technology links, in-house R&D (Viotti 2002, p. 661). This is in line with the modern emphasis on ‘absorptive capacity’, which goes beyond mere ‘passive’ absorption to emphasise that expenditure on technological inputs by the catching-up enterprise or country may be a necessary condition of effective absorption (Cohen & Levinthal 1990). Some of the CEE countries are still in the ‘passive learning’ phase. Those countries need to come out of that phase and move towards the ‘active learning’ phase. A range of policies have to be designed and implemented to support this kind of change in society.

Problems of Building National Innovation Systems in Catch-up Economies Stemming from Path Dependency

In addition to the latecomer advantages covered in the previous section, the transition economies share a common history of totalitarianism and planned economies, which has affected the whole logic of building the national innovation system. Many researchers believe that a large proportion of the inefficiencies and ineffectiveness
of national innovation systems may be related to path dependency and lock-in situations, as characterised by evolutionary and historical economics (Niosi 2002). Path-dependent processes are essentially phenomena whose outcomes can only be understood as part of a historical process. But those outcomes are not necessarily optimal. We investigate the proposition that the biggest and most widespread problem in building national innovation systems in catch-up economies is path dependency.

In the case of the new EU member states, the issue of path dependency should be looked at first at the level of the whole system of innovation. The change in the late 1980s was clearly systemic, where the majority of the components of the innovation system changed, though at different speeds. Some components were easier to change than others. For example, the replacement of fixed assets could be implemented within a relatively short period of time, but the institutions guiding economic transactions, like trust, could be introduced only gradually, over a period of decades. This created palpable problems of misfit between the components of the innovation system. The problem has been exacerbated by purely subjective factors. In many cases the analyses contained in the strategic development documents of the new EU member states give the impression that the policy makers do not want to face up to this issue. Wishful thinking and neglect of path dependency are very dangerous; the result is action plans that are inadequate, and in any case not implementable. Radosˇevic´ (2006) has suggested that the very low rate of involvement of researchers in the analytical underpinning of these strategic documents could be an important factor explaining this pattern.

Underestimation of the Role of the Public Sector in the National Innovation System

One fundamental consequence of the reaction to the heritage of the command economy is the widespread conviction in catch-up economies that introduction of the free market and minimisation of the role of the state will automatically lead to success and rapid economic and social convergence. This line of reasoning is a clear example of movement from one extreme situation, characterised by heavy interventionism, to the opposite extreme of ultraliberalism. von Tunzelmann (2003) has argued that market-based systems will be insufficient to induce semi-automatic sustained growth, because the development process is not linear but multidimensional and multilateral. A recent UNIDO report concludes:

> Public policies have played a fundamental role in these [development] processes and remain today at least as central to national economic development prospects as they have been in the past, particularly with regard to competence building, including investment in education, training and research institutions . . . . (UNIDO 2005)

It is worth emphasising in this context that the institutional landscape of S&T systems in the advanced economies is very varied. Government laboratories and university departments are major focal points, not just of ‘blue skies’ research but also of critical elements of technology development. Leading-edge technologies, especially in new sectors like biotechnology and software, are often developed in small spin-off and start-up companies, operating under strong, immediate market pressure. But the greater part of routine private-sector R&D is carried out in the laboratories of large companies, where scientists work within hierarchies not very different from those of the public and non-profit-making sectors. Often, and especially in the US, private-sector scientists work very closely with university scientists. Here, too, there
is path dependency, but it is benign path dependency, and has created an effective foundation for long-term economic dynamism on an institutional basis which defies analysis in terms of conventional, short-term microeconomics. In the new EU member states the incidence of private-sector R&D is low. Investments in R&D are made mainly within public sectors. The interaction between these two spheres is generally weak.

Even where the role of public policy in the innovation system is accepted, the catch-up economies often fall into the trap of imitation without analysis. ‘In many countries, policy makers are simply doing similar things to what has been done previously in other countries (or in the same country)’ (Edquist 2001, p.19). Examples are the many national technology programmes in the fields of information technology, new materials and biotechnology. The consequence is that variations in national characteristics between countries are often not taken into account. Just copying the systems which are successful somewhere else does not guarantee that these systems will also be successful in replicator regions. It is not a good idea to support one specific sector just because some other countries are developing it successfully (Boschma 2004, pp. 1010–1011).

Another legacy of the past is the negative attitude toward the notion of planning. Joining the EU, and having to prepare a series of medium-term planning documents for the use of EU structural funds, has been an important factor in changing this attitude. But the role of coordinating the allocation and use of EU structural funds has moved ministries of finance into the position of superpowers in the majority of catch-up economies. They take on decision-making power in a wide range of fields of economic and social development, and the negotiating power of other governmental institutions consequently weakens. The development of a well-functioning innovation system can be seriously hindered if the approach is wholly driven by monetary considerations. The national innovation system approach can provide a vehicle to reduce the tensions between the growing need to focus on long-term competence building in the economy as a whole and the requirements of short-run monetary discipline. Thus a top priority in the catch-up economies is the establishment of institutions able to provide analytical support for medium- and long-run development programmes, and free of direct political pressure. It should be noted at the same time that this can be very hard to accomplish in small, new EU member countries. Institutions in small countries tend to be linked with each other through a dense network of official and unofficial links. This makes it really difficult to establish totally independent institutions.

The Dominating Role of the Linear Innovation Model and the Neglect of the Demand Side

Hanson & Pavitt (1987), in their early comparative paper on R&D and innovation in command and capitalist economies, identified extreme bias towards the linear innovation model in communist bloc countries. Under central planning, the linear innovation model was all too convenient a tool for coordinating innovation processes (Radošević 2003). The focal point of technology development was in R&D institutes performing fundamental research, mainly for military purposes (Freeman 2006). At the next stage, applied research institutes were supposed to transform basic research results into useable production technologies and products. Firms waited passively for technology to be developed in upstream institutes, and they had no incentive to adapt or utilise new technologies (Watkins & Agapitova 2004, p.40).
It followed from this dominance of the linear model that the command economy system did not cultivate demand for technology from the enterprise sector. The demand factor was replaced by the planning authorities (Gosplan in the Soviet Union). As a result, the enterprise sector was divorced from both the supply and demand for technology (Watkins & Agapitova 2004, p. 41), and mechanisms for the generation of variety and choice were extremely weak (Högselius 2005).

After the systemic changes of the early 1990s the linear innovation model remained the prevailing innovation model for policy makers in transition economies. What this means in practice is the mystification of the role of R&D, which reflects a misunderstanding of the relationship between increased R&D spending and higher per capita GDP. R&D and innovation are often used as synonyms among policy makers in catch-up countries. The higher the expenditure on R&D, the higher the expected innovativeness of the given society. Unfortunately, this fetishism of R&D has also been cultivated in many of the recommendations given to the transition countries by various consultants and even by the EU. Such attitudes are also indirectly reinforced by a range of rankings, scoreboards and other comparative tools in which, for want of more appropriate measurement variables, R&D expenditure and similar indicators play the central role. It should be stressed that these problems are by no means unknown in Western Europe. Here, too, there has been a tendency in the past to lay too much stress on mechanical indicators and policies focusing purely on the supply of R&D (cf. the Lisbon Agenda). Now, certainly, things are changing. R&D is increasingly seen as a result, or an element in a matrix driven by market demands as well as technology supply, rather than a root cause. As Radošević (2006) has stressed, the argument that demand is the key factor in effective innovation is at least as applicable to the transition countries as to the advanced economies.

The majority of EU new member states are such small countries that, even if they increase their relative R&D expenditure to the level of the advanced countries, domestic research potential will remain extremely limited. Thus spending money on R&D will not by itself solve the problem of upgrading the technological capability and productivity of the main economic sectors of those countries. Indeed, rapid increases in R&D expenditure without significant reforms in the structure of R&D spending would actually represent a misallocation of resources. The experiences of Finland, Ireland and Korea show that increased R&D spending goes hand-in-hand with increases in GDP per capita when the share of private-sector R&D is growing. But firms in catch-up economies often do not operate at the technological frontier, and hence do not feel any internal need for R&D, as productivity growth does not require R&D. That in turn means that the demand for technological services from specialist R&D providers is weak. The key initial policy priority must, therefore, be to help firms to move closer to the productivity frontier through a developed innovation diffusion system, supported by an adequate knowledge base. Afterwards the firms can start to invest in R&D.

Confrontation between High- and Low-tech Industries

The dominance of the linear model of innovation among policy makers in catch-up economies has nurtured another prejudice — that the development of science-intensive industries can solve all problems. In the strategic documents of the catch-up economies the major focus has been on the creation of new high-technology industries — biotechnology, materials technology and ICT (Radošević & Reid 2006). Policy makers tend to believe that high-tech industries are synonymous with high value
added, high wages and rapid growth, and that creating high-technology industries will automatically help to generate competitiveness and wealth. It should be said that the problem with these propositions is that they are oversimplified rather than absolutely wrong. This oversimplification becomes dangerous when it results in an attempt to divert the bulk of resources into the creation of high-tech sectors at the expense of support for the general competitiveness of the so-called low-tech economy, which produces a dominant share of output and employs the majority of the workforce. The history of the first phase of transition in Poland is particularly instructive in this regard. The Polish economy did, in fact, slip down the technological ladder in terms of the balance of high-tech and low-tech sectors in the 1990s. The great achievements of this front-runner in transition during this period were, in fact, largely based on a general increase in levels of X-efficiency and productivity across the board in industry (Dyker & Kubielas 2000).

In the conclusions of the EU-funded PILOT project it was emphasised that the future industrial development in Europe did not depend on making a choice between high-tech and low-tech industries (Hirsch-Kreinsen et al. 2005; von Tunzelmann & Acha 2005). The symbiotic link between the two groups of industries was convincingly demonstrated. For example, low-tech industries are crucially important as customers of high-tech sectors in developed economies. This means that the continued viability of the high-tech sector is inextricably linked with the ongoing vitality of low-tech industries; once again the key importance of the demand for R&D is highlighted. Again, what is true for old Europe is a fortiori true for the new member states. Policy makers should focus on the processes of innovation and creativity within firms in all sectors, not just high-tech sectors. Otherwise there is a danger of creating a dual economy with low-wage, low-productivity traditional sectors generating the bulk of employment and GDP, and a small high-tech sector that is relatively isolated from the rest of the economy. A balance should exist between the two (or more) groups of economic sectors, including services sectors. The Finnish and Swedish examples in relation to the wood and paper industry show how a rich natural resource endowment can be used as a foundation on which to build competitiveness and wealth through specialisation in knowledge-intensive, high value added activities (Viitamo 2003). They show, furthermore, that competitiveness can be achieved by applying advanced technologies across the board in mature medium- and low-tech industries.

Overvaluation of the Role of Foreign Direct Investment

The majority of new EU member states are extremely dependent on foreign direct investment. Governments have sought to use FDI as a key mechanism for technology transfer and plugging into global networks — and thereby to shift the responsibility for innovation to foreign investors. This policy has certainly produced considerable short-term gains during the restructuring period. But recent findings give rise to suspicions about the long-term impact of FDI on sustainable growth. Productivity analysis of export-oriented foreign subsidiaries in Estonia indicates that FDI threatens to lock Estonia into a low-cost producer status (Vahter & Varblane 2006). In Hungary FDI has had a tremendous impact in terms of overall productivity and export potential, but has tended to produce a dual economy situation (Dyker et al. 2003). Here again, it seems that in new EU member states passive learning prevails over active learning.

Inward FDI does not necessarily help local firms establish linkages with foreign customers. Foreign-owned firms often produce mainly for export, or for other subsidiaries abroad within the framework of global supply networks. Without specific
joint public–private initiatives to support local supplier networks, FDI will not automatically bring local supplier skills and competencies up to international norms.

The innovation system should support the creation of linkages between foreign and domestic firms, but this process is largely blocked by the inadequate capacities of local firms, making them unattractive to foreign firms that in many cases show little vision in terms of the scope for developing local supplier capacities (Dyker 2006b). The role of a national innovation system is precisely to provide a corrective to the pattern whereby foreign firms seek primarily to exploit low-cost advantage, or more generally to absorb rather than create assets — which means putting a heavy emphasis on increasing the capabilities of local firms. What is needed is for learning in the host country to become cumulative, in order to facilitate asset creation. ‘So long as the principal learning processes are largely confined to the home country of the multinationals such long-term accumulation of knowledge in the converging economies is likely to be restricted’ (von Tunzelmann 2003, p.12). Local firms do not have the capacity to learn, unaided, from foreign companies operating in their neighbourhood. Only a strong local knowledge base can sustain the attractiveness of new EU member states to foreign investors in the face of inevitable convergence in real wage rates. This would encourage dynamic MNCs with competitive advantage based on a strong knowledge base to come to the new member states. It would foster the simultaneous development of exchange of knowledge between catch-up and advanced economies and improvement of the knowledge base of firms in the former. Without this development of the local knowledge base, the MNCs will simply turn elsewhere when wage costs rise.

Lack of Social Capital and Network Failure

The contemporary literature has looked at the relationship between social capital and speed of economic development, and has posited that the existence of social capital has allowed a sharing of knowledge and learning that has in turn led to rapid growth (Putnam 1993). Lack of trust is a serious barrier to the development of the innovation system in economies with a command economy past. Trust cannot be built overnight — only through repeated routines under which all participating actors will benefit in the long run can social capital be accumulated. The legacy of the transition period itself, marked by political and macroeconomic instability and radical system change, has induced actors to seek to reduce uncertainty and avoid or at least minimise interactions with other actors within the innovation system. Thus lack of trust leads to network failure in transition economies. von Tunzelmann (2003) argues that the basic weakness in transition countries is not so much ‘market failure’ or ‘government failure’ as pervasive ‘network failures’. Because of these network failures, the process of ‘learning by interacting’ is not working properly in the innovation systems of the catch-up economies. The network relevant to a particular resource flow may be missing (e.g. R&D services networks; see Dyker 2006a); or the network may be present but anti-developmental (e.g. nomenklatura-based); or the networks for different resource flows may be mutually inconsistent (e.g. MNCs versus local firms) (von Tunzelmann 2003, p.4). Network failure is a major source of weakness in the diffusion mechanisms of the system of innovation.

In order to meet the challenge of adapting the innovation system for development purposes, Kim & von Tunzelmann (1998) suggested an interpretative framework working in terms of the ‘alignment’ of various forms of interaction at different territorial levels of governance, i.e. sub-national, national and supra-national. As an
example, they show how the development of the Taiwanese and South Korean IT industries can be explained in terms of the role of policies oriented to the alignment of external relations, the national innovation system and the local technological system. For an elaboration of this approach in an Eastern European context under transition see von Tunzelmann (2004).

Weak Innovation Diffusion and Low Motivation to Learn

We can conclude from all of this that the success of catch-up economies depends heavily on the capability and willingness of actors within the national innovation system to search for, adapt and utilise knowledge produced outside those countries. In this process they need specific skills — to understand the knowledge stock, and to be able to use it and adapt it to create new knowledge. Nonaka (1991) has argued that learning about new technologies requires significant levels of absorptive capacity as a condition of being able to diffuse technologies produced elsewhere. But the knowledge needed to absorb new technologies is often not available in codified form. Since effective learning involves both tacit and formal components, a key task is to capture and codify — to make learning explicit.

Information about innovations and technologies is, however, neither free nor widely available, particularly for small firms. The majority of firms in catch-up economies are small in terms of the scope of management (even if they are often relatively big in terms of employment). For that reason, mechanisms to raise awareness of the available innovations, and the means of access to the relevant channels of communication, need to be organised explicitly. As the experience of Korea and Taiwan shows, this means building up networks of institutions for innovation diffusion management, to help firms to identify which technologies they need, and thus avoid the pitfall of inappropriate technologies. An analysis of the Estonian regional S&T intermediary system reveals, however, the kind of problems that can be encountered in this area. Estonian intermediaries do offer services like technology watch, collection of information on relevant existing technologies, and technological audit, but levels of competence of the employees of these intermediaries are inadequate. Usually the employees of the client SMEs know much more about the new technologies and production possibilities existing in their area than the intermediaries. This is mainly a problem of the R&D-intensive industries. Intermediaries are able to help enterprises on the general level, but not in specific areas. The situation may improve as employees of intermediaries gain more experience, but even at best they cannot be competent in every area. In sum, in the context of latecomer economies with a command economy past, the technology transfer problem as a problem of learning in enterprises and intermediaries is central.

Many authors have drawn attention to the importance of developing learning capabilities in organisations as an aspect of innovation policy (see Viotti 2002). Organisations, as a key element of the innovation system, need to learn and change if they are to survive (Bessant & Francis 1999). By contrast, the critical task for the catch-up economies is to increase the learning capacity of the whole society. As Lundvall et al. (2002, p.224) remark, ‘the very rapid rate of change [in innovation systems] gives a premium to those who are rapid learners’. The implication is that speedy catch-up requires rapid learning. Hence the future of catch-up societies depends crucially on success in implementing rapid learning (technical, managerial etc.) at the level of organisations, and at the level of society as a whole. It is essential to recognise that learning is not automatic — there must be motivation.
to enter the learning cycle. This is one of the major challenges of innovation policy in the catch-up economies — simply to encourage the understanding that learning is necessary. Here again it is key to overcoming path dependency in thinking. And in cases where the catch-up process is already proceeding rapidly (e.g. in the Baltic countries) the lack of extra-organisational stimulus to change can become a serious problem. In sum, as long as the existing business model continues to generate steady, rapid growth, it is extremely difficult to persuade the actors in the innovation system (not only firms but also policy makers and non-market institutions) to enter into the learning cycle in a serious manner.

Figure 1 is based on a World Bank study (2002) which analysed the technological ability of firms to innovate and their willingness to change in Korea. It can be used to highlight the key issues of the innovation system in catch-up economies. In Figure 1 firms are distributed into four groups based on the degree to which they are aware of the need to change, and the degree to which management is aware of what should be changed and how to go about changing it. At the lowest level are firms that have no capacity for technological change, and which do not feel any need for change. That is exactly the case of many firms in rapidly growing catch-up economies like Estonia. Firms do not feel that they need to change because the current business model seems to them to be good enough. Most transition economies have a significant number of Type 2 and Type 3 firms, and even a sprinkling of Type 4 firms. But they do not have enough of these higher categories of firm to give the company sector the critical mass it needs to develop into a vehicle of sustained economic catch-up.

The task of the innovation system should be to move firms up the ladder described in Figure 1. That requires activity in two directions.

- To encourage firms to improve their capacity to absorb technologies from abroad and innovate by providing access to different sources of technology.

Figure 1. Classification of firms by their technological capability and motivation to change.
• To improve the internal motivation of firms to change, which involves providing the data that firms need to assess their relative position with reference to best practice in the world at large. In that context, intermediaries in latecomer countries have to improve the quality of their services by increasing the competence levels of their employees.

The latecomer advantages of the catch-up economies have created short-run success, and this in itself has tended to result in very low motivation to create learning capabilities. To make matters worse, firms in transition countries often fail to learn because they are isolated and lack support for key stages in the process, partly because of elements of path dependency stemming from the old planning system. Practical experience suggests that learning can be supported by structures and procedures to facilitate the operation of the learning cycle, and that this, indeed, is the mark of a properly functioning innovation system. It is important for the catch-up economies of Eastern Europe also to remember that the innovation system functions successfully when the learning process is sustainable, and can generate high long-term rates of return. Fransman (2000), in his commentary on the learning-success stories of East Asia, has noted that

It is not enough to demonstrate that firms have learned; not even enough to demonstrate that they have achieved internationally competitive outputs. Important too are the longer-term rates of return that these learning processes provide since in general it is rates of return rather than rates of learning that drive capital markets, which are a key component of the selection environment of firms. (Fransman 2000, p. 224)

Policy Recommendations and Conclusions

The policy recommendations that follow can be enumerated as follows.

(1) The need to implement a strategic, long-term approach to the building of innovation systems, free of the tyranny of purely short-term financial objectives, must be acknowledged.

(2) The linear innovation model must be replaced by an approach based on the notion of balanced interaction. Innovation should not be equated with R&D. A much broader focus is needed, based on an understanding of the importance of non-R&D dimensions of innovation for catch-up economies.

(3) Discrimination against low-tech industries, which command the bulk of resources, in favour of the creation of high-tech sectors, is not an appropriate policy for catch-up economies. Rather low-tech and high-tech should be viewed in terms of a symbiotic partnership, based on a clear understanding that the continued viability of the high-tech sector depends on the vitality of low-tech industries.

(4) Much more attention should be paid to the development of the system of absorption and diffusion of knowledge, whether produced outside or inside the catch-up economies. At the firm level that means activity in two directions — reinforcing the motivation of firms to change, and supporting the process of building firms’ absorptive capacities. In this context networking needs to be improved.

(5) Sustainability of economic development cannot be achieved exclusively on the basis of the innovation activities of foreign investors and their global networks. Integration of local firms into networks of foreign investors should be strongly supported.
(6) Human capital development is important, but investment in the education system, and particularly in higher institutions of science and engineering, needs to be coupled with policies to increase the number of employment opportunities requiring those skills.

(7) Managerial and organisational skills are more important factors of innovation even than access to modern technology.

(8) Appropriate technology policies for catch-up countries can be worked out only on the basis of a general audit of the technological absorption capacity of the whole population of firms. The results of audit and benchmarking exercises should be widely disseminated within the national innovation system in order to reinforce the motivation to learn.

(9) Technological path dependency should be seen by catch-up economies as an opportunity rather than as a threat. Technological lock-in could mean that the resistance to change is weak, even if the motivation for change is also weak, offering an opportunity to catch-up countries to skip a whole generation of technology and introduce new solutions, if effective stimuli can be brought to bear on key focal points of decision making.

References


National Innovation Systems of New EU Members


