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KNOWLEDGE PRODUCTION AND NATIONAL INNOVATION
CAPACITY IN TRANSITION

Transformation of the Central European Research&Development systems
1989-2002

A SURVEY OF LITERATURE

A First Draft

Motivated by differences in R&D productivity across transition economies, this paper presents a systematic examination of the determinants of country-level technological [and related scientific] knowledge production. We introduce a novel framework based on the concept of national innovation capacity. National innovation capacity is the ability of a country to produce and commercialize a flow of innovative technology over the long term. National innovative capacity depends on the strength of a nation common innovation infrastructure [cross-cutting factors which contribute broadly to innovativeness throughout the society], the environment for innovation in its leading industrial clusters, the new knowledge generating skills of the research sector, and the strength of linkages between these three areas. We use this framework to guide our exploration into the determinants of country-level knowledge production related to new technologies, specifically examining the relationship between basic research and its institutions and variables associated with the national innovative capacity framework. Reinterpretation of existing studies offers evidence for several findings. First the production functions of basic research in the region is well-characterized by a small, but relative nuanced set of observable factors, including R&D manpower and spending, aggregate policy choices [f.g. openness of the research system to international trends and its dependence on international sources], and the share of research performed by the academic sector and founded by the private sector. As well, the performance of those capacities depends on each individual country's knowledge stock. We try to characterize the major socio-cultural differences influencing the consistence of that "stock". Further, the predicted level of national innovation capacity has an important impact on more downstream knowledge diffusion and learning activities. Finally, as long there has been convergence among "old" OECD countries in terms of the estimated level of innovative capacity over the past decades, the knowledge generation capacity of the East-Central European countries during the 90ies diverged sharply. Especially the variation among transition and advanced economies in their ability to innovate at the global frontier and to generate new

knowledge used internationally raises an empirical puzzle: if investors can draw on technological and scientific knowledge from global sources, why does R&D productivity depend on location?

At the end we pay special attention to the utilization of knowledge in the higher strata of the political power, especially the social science expertise.

KNOWLEDGE AND LEARNING

In a society or in some of its moduls, there are various kinds of knowledge, which altogether constitute the knowledge base of that social organisation or structure. The knowledge base of that economy is a compound of knowledge that exists on different levels of aggregation: company specific, generic, or industry specific, and universl, and involves both individual and collective knowledge, as well as various degress of tacit and explicit knowledge. Because new knowledge is continually created through the interaction between tacit and codified knowledge, knowledge bases of firms and industries are in constant evolution. Actors learn, and by doing so they increase their knowledge base by incorporating new knowledge, which often implies that some of the old knowledge is no longer applicable. This necessitates an additional process of “creative forgetting” (Lundvall and Johnson 1994). The two processes of learning and forgetting make up the concept of interactive learning, which includes imitation, searching, exploring and any other activity that will lead to the increase of economically significant knowledge (Johnson 1992, Nelson and Rosenberg 1993).

Like knowledge, interactive learning is characterised by cumulativeness, or path-dependency, due to the importance of institutional context for knowledge creation and transmission, and like innovation, interactive learning is a ubiquitous phenomenon that takes place on every level of the economy and society. Interactive learning may take place inside a social unit, or between them, or it may result from the interaction in a network of firms and other economic agents. In addition, interactive learning may be intentionally promoted, or occur as unintentional by-products of routine activities (Lundvall 1992).

One way to go beyond the Oslo Manual is to distinguish between creative and imitative innovation. This distinction goes back to Deutsch (1944), who used the terms ‘initiative’ and ‘imitative’ innovation, and Schumpeter (1947), who suggested distinguishing between ‘creative’ and ‘adaptive’ response. Schumpeter associated the latter with the imitation of an already existing innovation (i.e. without improving it), while the former was seen as a ‘new combination’, i.e. a genuine innovation. I here define creative

innovation as the first application of a new combination and imitative innovation as its subsequent application.

Research and development related activities is yet another important kind of interactive learning when it comes to technological development and innovation. These activities intentionally aim for the discovery of new knowledge, and tend to be very structured, involving complex modes of interactive communication.

Some of the contemporary efforts to analyse the complexities involved in the creation and diffusion of knowledge and technology into the economy, is focussed around the idea of innovation systems (Lundvall 1992, Nelson 1993, Edquist 1997). The innovation system concept suggests that there exist certain structural influences (scientific, political, and socio-economic) within any nation state, or region, that help define the pattern, nature and extent of knowledge accumulation and innovation within a given industry, region or nation. An innovation system is largely defined by the interactive learning relationships, taking place between economic actors within the institutional framework in which they are located. The institutional framework, or institutions, is further defined as the “sets of common habits, routines, established practises, rules, or laws that regulate the interaction between individuals and groups” (Edquist and Johnson 1997). In this respect, institutions seem to constitute part of what we referred to as collective knowledge above.

While R&D activity is relatively dispersed around the world, innovation of “new-to-the-world” technologies has historically been concentrated in a few countries. This variation among advanced economies in their ability to innovate at the global frontier raises an empirical puzzle: if inventors can draw on technological and scientific insights from throughout the world, why does R&D productivity depend on location?

Despite substantial agreement about this proposition, there is a great deal of debate about the underlying drivers of the innovation process itself.

International variation in R&D productivity presents an opportunity to examine how different influences contribute to technological innovation and thereby distinguish among different drivers of productivity growth. Estimating the impact on innovation of country-level policy differences ties more directly to policy evaluation. We introduce a novel framework based on the concept of national innovative capacity. National innovative capacity is the ability of a country – as both a political and economic entity – to produce and commercialise a flow of innovative technology over the long term.

Innovative capacity depends on an interrelated set of investments, policies, and resource commitments which underpin the production of new-to-the-

world technologies. National innovative capacity is not the realized level of innovative output at a single point in time but reflects the more fundamental determinants of the innovation process.

We develop the national innovative capacity framework by drawing on three distinct areas of prior research: ideas-driven endogenous growth theory (Romer, 1990), the cluster-based theory of national industrial competitive advantage (Porter, 1990) and the literature on national innovation systems (Nelson, 1993). These theories share common elements; however, each also contributes a distinct perspective. For example, in models of ideas-driven growth, the ideas production function depends on two aggregate factors that influence the rate of innovation in a national economy: the prior stock of knowledge accumulated by that economy and the level of R&D effort devoted towards ideas production (as opposed to final goods production). Porter (1990) emphasized the microeconomic underpinnings of innovation in country-specific industrial clusters; this relationship depends on subtle interactions between input supply and local demand conditions, the presence and orientation of related and supporting industries, and the nature of local competitive rivalry. By focusing on industrial clusters rather than individual industry segments this perspective highlights how the rate of innovation depends critically on both knowledge spillovers and the nature of technological interdependencies across related sectors. Finally, the national innovation systems literature, built on rich descriptive accounts of the organization of innovation in specific countries, tends to emphasize the role of the overall national policy environment, the educational sector, as well as more idiosyncratic institutions that affect innovation but for which international comparison is difficult (e.g., the rules of specific funding agencies in individual countries). National innovative capacity depends first on the presence of a strong common innovation infrastructure. Second, a country's innovative capacity depends on the more specific innovation environments in a country's industrial clusters. As emphasized by Porter (1990), whether firms invest and compete on the basis of new-to-the-world innovation depends on the microeconomic logic inherent in their local competitive environment. Finally, national innovative capacity depends on the strength of linkages between the common innovation infrastructure and specific clusters. This theoretical framework can be used to evaluate the sources of cross-country R&D productivity differences.

The bulk of the empirical analysis focuses on a detailed examination of the relationship between international patenting and different potential contributors to national innovative capacity. The framework provides insight into the nature of country-level R&D productivity differences. In that

respect, R&D productivity differences result from factors associated with each of the distinct sources of national innovative capacity. On the one hand, a number of different elements of the economic environment vary across countries, including the access to cutting-edge knowledge, the degree to which R&D expenditures are driven by private sector investment, and the presence of mechanisms such as universities which link innovative efforts across the economy. On the other hand, R&D productivity differences are associated with political environment is important for understanding why countries differ in their R&D productivity.

Ideas-driven growth theory, the most abstract conceptualisation, focuses at an aggregate level, emphasizing the quantifiable relationships among a small set of factors which determine the flow of new ideas in an economy.

According to this production structure, the rate of new ideas production is simply a function of the number of ideas workers and the stock of ideas available to these researchers. Whereas ideas-driven growth theory focuses almost exclusively on this critical but narrow set of factors, Porter (1990) also incorporates a more nuanced treatment of the impact of the microeconomic environment in evaluating the relationship between competition, innovation, and realized productivity growth. Above and beyond the simple availability of trained scientists and engineers (as emphasized in ideas-driven growth theory), R&D productivity depends on the degree to which R&D personnel are specialized in disciplines and fields congruent with emerging innovation opportunities in the local environment. This “matching” process is more likely in the presence of institutions such as research universities and allocation mechanisms such as efficient labour markets for newly trained PhDs.

A further determinant of cluster-level innovation is the nature of domestic demand for innovative products and services, which depends in turn on the presence of a sophisticated, quality-sensitive local customer base for the cluster’s goods. While both the ideas-driven growth models and theories of national industrial competitive advantage incorporate the role of public policies in shaping the rate of innovation (at least to some degree), the national innovation systems literature emphasizes the active role played by government policy and specific institutional actors. Particular institutional and policy choices highlighted by this literature include the nature of the university system (Nelson and Rosenberg, 1994), the extent of intellectual policy protection (Merges and Nelson, 1991), the historical evolution of industrial R&D organization (Mowery, 1984) and the division of labour between private industry, universities and government in R&D performance and funding (Mowery and Rosenberg, 1998).

Although there is little discrepancy surrounding the idea of technology as the engine of economic growth (Breshnahan 1986; Trajtenberg 1990), there is less consensus on the spatial impact of R&D on the genesis of growth promoting activities, especially at a subnational level. The question often asked is whether it pays to invest in R&D, especially in the case of relatively small countries or regions.

From a Schumpeterian point of view there is a positive answer to that question. It is argued that the returns of every nation's or region's R&D effort tend to be positively associated with the amount of resources devoted to improve technology, and benefit from strong cumulative effects (Scherer 1982; Dosi 1988; van de Klundert and Smulders 1997). There are, however, strong threshold effects linked to an area's R&D effort. The larger the effort, the larger the expected return. Hence, from this perspective, investment and employment in R&D are likely to encourage the development of economic activities in large territorial units where a critical mass of R&D can easily be reached, and fundamentally within the framework of national *innovation* systems. The empirical link between knowledge inputs with innovative output is apparently stronger as the unit of observation becomes increasingly aggregated. In contrast, a reduced R&D effort in smaller territorial units--such as most Central European regions--may not yield the expected returns. Territorially speaking the expected local returns of investment in R&D may be further jeopardized by the mobility of knowledge derived from R&D, that is, by the genesis of spillovers. Technological advances tend to be generated in areas with the greatest concentration of R&D activity, be it in the form of private company research, government funded programs, or research conducted by universities. However, once developed, R&D related *innovation* becomes spatially footloose, especially in an increasingly open economy that knows fewer technological and legal barriers than it did a few decades ago. The existence and importance of technology spillovers is well documented at an international level (Lichtenberg 1992; Park 1995). Collectively, spillovers imply that investing capital and human resources in R&D in any part of the world leads to greater global economic activity. When research spillovers begin to operate, production units in areas with little or no R&D activities can, in theory, benefit from technological progress--provided they belong to the adequate industrial and communication networks--as much as firms located in areas where *innovation* is generated. There is thus a risk of free-riding. However, the mobility of technology and *innovation* is far from being costless and territorially even. Since the diffusion of technological spillovers is often achieved as a result of the existence of research and economic networks, in

order to benefit from the spread of *innovation*, regions still need to host the necessary research centers and the adequate research personnel capable of linking to those networks. As a result, the transaction costs of transmitting tacit knowledge rise along with distance. Thus, the general view is that the impact of spillovers is greatest in areas with a strong concentration of R&D facilities, larger firms conducting R&D activities, and higher investment (Smulders 1997). The transmission of tacit knowledge in these areas then leads to the genesis of self-reinforcing virtuous circles of accumulation and to the creation of multiplier effects (Verspagen 1997). In contrast, the capacity of most areas to benefit from technological spillovers generated in distant locations may be limited. Hence the possibility of free-riding, which might deter individual firms and different tiers of government from engaging economic and human resources in R&D related activities, is, to a certain extent, compensated by the costs of benefiting from spillovers.

Incentives to free-ride are strongest at the subnational level, since the transaction costs associated with the assimilation of spillovers are perceived to be less important and the generally limited size of the local R&D effort and the lower expected returns associated with it make it almost a necessity. The degree of integration of regional economies within a nation is far greater than that of nations in the world economy, and, in theory, the mobility of *innovation* is amplified and its transaction costs reduced within the framework of an open national economy.

In addition to size and the existence of spillovers, a third factor that may jeopardize attention and investment in R&D by subnational territorial units are the problems linked to the appropriability of technical *innovation* (Harabi 1995; Storper 1995). As Storper (1995) underlines, technology and the innovations linked to technology are non-rival and non-excludable goods, and therefore difficult to appropriate.

The combination of these factors generates a conflict between collective and private interests, which may ultimately lead to a reduction of the R&D effort at a regional level, and especially in regions with low R&D capacity.

Whereas collectively it is beneficial for every region to increase its R&D effort, individually the possibilities of benefiting from technological spillovers and the problems of appropriability act in an opposite direction. Does it pay to allocate resources to R&D at a regional level or in a smaller country? Despite the aforementioned problems, most recent research has defended the idea that devoting resources to R&D pays off at a national level, since R&D spillovers are neither instantaneous, nor complete (Lichtenberg 1992). Park has shown with panel data for 10 OECD countries that "the fact that domestic private R&D has the higher rate of return may

explain (partially) why countries engage in research rather than free-ride on the research activities of the rest of the world, since substituting \$1 of foreign private research for \$1 of domestic, holding everything else constant, leads to a net loss in domestic output" (Park 1995: 583).

POST 1989 DEBATES

At the beginning of the transformation most of the formal socialist countries entered in a period of heavy debates concerning the future of their research and knowledge generating possibilities. Dreams and utopia, short-term interests and views of potential competitors, traditional Western models of „good institutional structures” of science and local needs in networking, more or less optimistic and pessimistic visions on the future role of transforming societies in the global economy were present in different mixtures. The most significant opinions were representing values and interests of particular groups.

The national research elite was naturally a believer in the importance of science, knowledge generating capacities and research for the social and economic reconstruction. Those views had 3 major components: elitist views on the role of science and scientists inherited from the socialist period, reflections on the special experience being involved into international cooperation even in those years when other strata of the national elites had less contacts with the outside world, and perceptions of a quality-of-performance controversy. In the basic understanding the socialist order in its statements was definitely pro-science and this was positively perceived even by the critical intellectuals opposing the regime. The relationship to some still present elements of Enlightenment incorporated into socialist ideologies was usually well-received even even by the anticommunists. At the same time state authorities permitted R+D professionals and some public intellectuals -at least in Poland and Hungary- to accept invitations to international conferences and fellowships of western universities. Larger parts of the „Eastern” research elites were staying for longer periods, in some cases for years already, before 1989 in those countries. Therefore the research elites believed in the importance of its contacts and communication skills for the reconstruction of the nation at large. And naturally they were proud of and with their research results in an international content. In most of the cases, however they looked at their own performance in relativistic terms. Their results are well accepted despite of the hardships and shortages in their professional environments. So, in principle they could produce much more, if their conditions will improve. The program emerging from this was simple and straightforward: reconstruct the science and that will have a

multiplicatory and positive effect on the whole society.

Younger professionals in the R+D system were thinking less about the societal impacts, and more about their own life-perspectives. Their dream carrier scenarios were, especially the early 90ies, predominantly international. The strong national research system or at least its graduate training part was in that respect a prerequisite for their future international success. Or as minimum, an alternative aeroport for emergency landing. Western science policy experts- especially of those invited from the OECD in the early 90ies for the evaluation were more critical on the dominant organizational patterns of the available research-development capacity. Relatively large concentration of R&D capacity in industrial research institutes isolated from the production units was portrayed as especially non-effective. And in more general terms, they didn't believe in a possibility to feed in longer term the industry, or production-related research potential for better times if and when industrial interests were unable to support or utilize then at a givel point of restructuring in the national economy. The available potential was too big and its institutional and organizational frames were understood by the invited ecperts as too rigid. National business elites emerging during the privatization were usually in a serious way not interested in the available knowledge producing capacities. In many cases, of course, they were ready to take over the existing industrial R&D results inherited from the former state socialist research sector but the were not ready to multiply or further develop them. The time span of their actual business plans and of the research were in most cases too far from each other.

Multinational companies entering into the region had very divers interests, visions and needs concerning the local knowledge generating capacities and R&D potential. Car manufacturers representing a major group entering into the region were usually not interested in local intellectual excellence. Some electronics manufacturers were more sensitive other less to the local knowledge offers in knowledge production [e.g. GE, or Nokia were and remained positive, Siemens or Phillips neutral or non-interested on a larger scale]. The service companies after some hesitation started to pay some attention to the local tacite knowledge and the tailoring capacities for their imported implementable systems.

National political elits of the early 90ies were more ambivalent on the R&D and in more general terms, on the knowledge generating capacities of their respected societies. On one side that system was understood as part of the national heritage and identity of a „civilized”, or developed nation and an important factor to use it in a similar way in the future, as well. But the

„fireman” political philosophies of that time forced to neglect everything and everybody unable to protect its interests and capable to immediate and noisy local protest or sharp intellectual critics of the emerging order. In that sense knowledge workers didn't represented any strict danger for the ruling elites. Some intellectuals, researchers or university lecturers reflecting the former high prestige and social perceptions of their professions were naive enough to believe, that the society ready to „defend” them and able to force the ruling elites to pay more attention to the emerging tensions in the knowledge sectors. But, of course, usually that never happened or at least not on a serious scale. However, starting from the late 90ies with the slowly improving economic performance in Central Europe, with the partial collapse of the neoliberal development policies of the previous years and finally with the arrival of different neo-etatist forms of governance that problem of different time perspectives was slightly modified and in some way even reversed. Practical forms of integration into European and trans-Atlantic international organisations played here a positive role. EU, NATO or OECD divisions and programs had a demonstrative effect for the local political class. If they ready to support different local forms and capacities of knowledge protection, then maybe we should also promote them? The integration formulated an other type of knowledge demand for the local political elites as well. For improving their interface with the foreign partners they were forced to [re]develop some knowledge generation capacities inside of government, or at least available in easy forms to it. The values and expectations in those different groups we present in a simplified way in the next matrix:

Groups/ values	Symbolic value	Scientific quality	Social role	Economic impact
National research elite	Very high	Very high	Neutral	High
Young R+D personal	Median	Mediocre	None	Partial
Western R+D policy experts	None	Mediocre	Neutral	None
National business elites	None	Insignificant	Mediocre	Neutral
Multinational companies-strategic	Minimal	Mediocre, concentrated in particular	Insignificant	Partial, but high

analysts		platforms		
Political elites-early transition	Very high	Important	Important	High
Political elites of consolidation	High	Neutral	High	Neutral

MODERNIZATION AND KNOWLEDGE PRODUCTION

Traditional East European insights on modernization derive primarily from the critique of modernisation's 'dual society' thesis. This thesis holds that the 'modern' and 'traditional' sectors of developing societies are independent. The former sector is modern because of its exposure to the outside capitalist world. The latter is 'under-developed' because it has lacked such exposure; but it can be modernised through the diffusion of 'capital, institutions, values' (Frank, 1969: 4). Based primarily on comparative research on dependent regimes of the world system, that approach argues that, on the contrary, 'underdevelopment is not due to the survival of archaic institutions and the existence of capital shortage ... (but) is generated by the very same historical process with also (generates) economic development: the development of capitalism itself' (1969: 9).

Unlike Frank, who pays scant attention to social analysis, new post-socialist dependency analysts, following Cardoso and Faletto focus their study on how local social groups and practices reproduce and/or resist domination (in the post-colonial period). They delineate two main dependency situations, one in which there is a relatively strong local state that allows for more national control of development, the other, an 'enclave situation', in which foreign interests dominate, thereby allowing for less national control. For them, the type of local dependency is dictated by the specific nature of alliances among and between local and foreign classes, groups and ideologies (labour, national or collaborating bourgeoisie, state bureaucracy, nationalism, populism, multinational corporations, etc).

Hybridity describes the way in which colonial and imperial discourse is inherently unstable, 'split' in its 'enunciation', so that 'in the very practice of domination the language of the master becomes hybrid' (Bhabha, 1994: 33). Bhabha illustrates this instability through an analysis of the 'colonial stereotype', which he considers an instance of the deployment of imperial authority. Not surprisingly, Bhabha repeatedly refers to subaltern agency as a form of 'negotiation' (1994: 38). It also means that the agent cannot harken back to pre-colonial... discourse in search of an 'authentic' identity or out of 'nostalgia for lost origins' (Spivak, 1988: 291). The primary

reactions to the colonial-post-colonial type of discourse among post-socialist intellectuals are quite ambivalent. Some are using it as a political, “non-scientific” metaphor. For many others it is just unacceptable. And finally, a minority ready to use it “translating” the historical experience of co-habitation with the Soviet- and German-centered World systems. The second (and related) implication of the instability and ‘doubleness’ of discourse is that it enables the retrieval and recognition of difference. The object of postcolonial concern here is orientalist binary categorisation (e.g. coloniser-colonised, western –Eastern, civilised-uncivilised), into which the ‘other’ is invariably incorporated. Post colonialism seeks to preserve heterogeneity and to criticise its disparagement or transcendence by any master discourse. From the point of view of the dependentistas, this neglect is unfortunate, given their intention precisely to look at imperialism from the perspective of the periphery; but from the point of view of post-colonial theorists, it is not unexpected, given their argument, that counter-discourses often reverse or perpetuate newly discovered traditional representations. Such is the case with dependency’s construction of binary opposites – ‘developed-underdeveloped’, ‘centre-periphery’, ‘metropol-satellite’ – which, although attempting to shift analytical focus to the second term, leave unexamined and untouched the power relationship between the two. The ‘centre’ continues to be just that-central and dominant-so that the West ends up being consolidated ‘as sovereign subject’.

For the new critics of growing asymmetries in regional knowledge production capacities of Central Europe, the key characteristic of present international regulation is ‘ungovernance’: an increasing number of issues remain unregulated. The existing regulation tends to express the interest of dominant states and private actors, rather than the outcome of a formal political process. There is growing asymmetry ‘between states whose domestic policies have an impact on societies and economies other than their own, and states which have no such power and were more likely to suffer and have to adapt to the domestic policies of the more powerful governments’ (Strange 1998, 706).

This general caveat is directly tied to some of the most heated and central debates about post-Soviet development today. First, the debate about the nature of structural shifts is far from closed and much remains to be done to refine and develop our understanding of these shifts. Many authors contest whether they exist at all. Some argue that the world is comparatively much less integrated than during the Cold War. Others claim that the present trend is merely a ‘return’ to normal. Second, further specifying what is meant by ‘no opt out’ and how much scope for variation remains seems very

important. That perspective tends to assume rather than elaborate on the mechanisms by which structural shifts affect Central European countries. Indeed, the question of how international and national structures are articulated has haunted not only dependency scholars and their present day heirs, but most political economy work on post-socialism.

Obviously, in respect of knowledge production structures one of the key changes of the past two decades has been the internationalisation of production and the associated change in relations between post-socialist countries and foreign investors. We believe, that development prospects, as well as internal institutions and 'state capacity', are now largely shaped by firms and the firms therefore have to be at the heart of any serious analysis and explanation of knowledge production strategies around new technologies in the region discussed here. However, the potential for 'dependent development' does not mean that the East-West gap will disappear soon or even narrow for the non-Central European societies of transformation. In some respects it may widen. Maybe therefore for many post-Soviet countries it is even virtually impossible to get a foothold in the international service sector that is increasingly important for growth and social emancipation in the knowledge economy.

The role of the state in the post-socialist countries is not neglected in the literature. But is poorly understood due to the attention devoted to the institutionalisation and defence of emerging markets. Claims to sovereignty and authority over the economy and society are taken very often at face value. Yet state authority is increasingly problematic, particularly in its neoetatist and elite-centered variants. The developmental path, the nature of national institutions and politics, and the growth prospects of post-socialist countries are increasingly determined at the international level, by international finance and by private actors. As a group, scholars of post-socialism have left out in this process to states who benefit from the working of the system. But to paraphrase Strange (1996: 189) at the same time power has shifted upwards from weak states to stronger ones with global or regional reach beyond their frontiers and shifted sideways from states to markets and thus to non-state authorities deriving power from their market shares. And finally in many aspects the state as resource, or guarantee of local knowledge production has evaporated, in that no-one is exercising it. The last point bears repeating: the loss of authority is not zero-sum.

The picture that the mainstream transformation literature paints of the state's role in national knowledge system developments is discomfoting. It is both telling us that the state has a central (albeit changed) role to play in development and that it is decreasingly (albeit unequally) capable of filling

this role.

Discomfiting as it may be, this argument suggests a number of important questions. A first set concerns the extent to which the state in general, as well as the state in given Central and East European countries, has actually become 'defective' and hollow. From one perspective we insist that the loss of state control over social, economic and political aspects of knowledge production is very unequal; while some are increasingly akin to no-go grey-zones, others have lost control in the same way as industrial societies of the West have lost control. For any one country it matters what kind of loss of control one is talking about. It matters for what policies are realistically part of the options from which the state can choose and it matters for the prospects that any kind of policy will be effective.

Second, there is the issue of what happens to democratic politics in a world where private and foreign actors make a very significant share of the decisions and where the state makes it an absolute priority to cater for business needs. Authors in international political economy (IPE) have argued that the result is likely to be a more authoritarian or restricted form of democracy (Evans, 1997; Gill, 1997). However, at this point the countries of transformation offer an other perspective.

The issue of how international structures interact with national ones is prominent in much work on new democracies, ranging from that of liberal economists to the present day heirs of dependency scholars, passing by the work of constructivists. Similarly, there is extensive writing on why some institutions, countries and social groups are empowered and disempowered by international changes and why they are better at dealing with them. Finally, on the issue of reform prospects there is extensive work in 'liberal' and institutionalise approaches in international relations and in economics.

NATIONAL INNOVATION SYSTEMS- NATIONAL CAPACITIES TO INNOVATE

Johnson and Lundvall (2000) point out that, when there is no more a consensus on one "best-practise" or a unique key factor concerning development strategies, "the concept of innovation systems is helpful both as an analytical tool and as a guide for policy making". We would add that the whole issue of endogenous generation of knowledge in underdeveloped countries has been also underestimated, in spite of outstanding contributions, like those of Sabato and Mackenzie (1982).

The fact that four different types of capital – production, natural, intellectual and social – are interdependent is, for Johnson and Lundvall, a major reason for promoting the systemic and interdisciplinary approach that is needed for

coping with the many sided problems of knowledge and environmental sustainability.

When the NSI theory is analysed from the perspective of underdevelopment, we should maybe pay special attention [following Arocena & Sutz(2000a)] to some general remarks. First of all “National System of Innovation” is an “ex-post” concept, that is, it has been built, in the old OECD countries, on the basis of empirical findings. The concept can be relatively easily validated due to the former state socialist research systems in Central Europe, but not in many other parts of the world of transformation. On the contrary, in these regions it is rather an “ex-ante” concept, because socio-economic behaviour in the actual conditions regarding innovation at national level is, in fact, hardly systemic. Second, the National System of Innovation concept is “relational”: almost all the literature on the subject stresses the utmost importance of the connections between different types of collective actors.

And of course, the “National System of Innovation” is a policy subject. This does not mean that the whole shape of the system can be purposefully designed.

Actual Post-Socialist thinking about the issue “science – technology – development – dependency” started to pay attention sometime ago to “the problem of interactions”, facing questions as the following: “When, why and how does a society create a demand for science is a given historical situation? What internal and external factors determine the science supply? How do the fluxes of supply and demand move across the different socio-economic circuits? Who profits from the results of scientific and technological research? How do the different actors react to external demands? How and why does the productive structure and the scientific and technological infrastructure alienate from each other? What role corresponds to the state, particularly in developing countries?” Similar questions in that form were raised much earlier in other dependent areas [mainly in Latin America] discovering their dependence ofrom the international centres already in the 70ies (e.g. Sabato 1975: 129). To study such issues and in order to have a guide for building a “virtuous circle” able to put science and technology at the service of development, Sabato proposed “as a model of interactions a triangle with its vertexes representing, respectively, the scientific and technological infrastructure, the productive structure and the government, defined as the fundamental protagonists of those interactions” (Sabato, 1975 130). Such model known as “the Sabato triangle”. The importance of the relations between the protagonists is particularly stressed there: no matter how strong each isolated organisation was, much more

important was the strength of the connections between them; in fact the triangle exists at all only if the connections are there.

In many aspects Central European NSI are moulded by an insertion, in the international economy, that is characterised by specialisation on production based on natural resources, with comparatively low and mainly imported technological added value. Several features previously considered are connected with this type of international specialisation that fosters the emergence of what we could call neo-peripheral systems of innovation. In a quickly changing world, the more or less “central” or “peripheral” character of a nation or region does not keep still. In general, the most relevant phenomenon is the transformation of the factors that shape the gap between centres and peripheries: at present the fundamental influence stems from the “learning divide” (Arocena and Sutz, 2000).

The systemic approach on learning by interacting lead naturally to propose the concept of “interactive learning spaces” (Arocena & Sutz, 2000).

Different types of economic growth have very different consequences concerning the generation of interactive learning spaces. Conversely, the relevance of the last greatly influences the type of growth and, especially, the extent to which it is based on knowledge and driven by innovation. As a “stylised fact”, we may say that transformation countries and dynamically integrated social groups everywhere are “interactive learning spaces rich”, while underdeveloped countries and disfavoured social groups everywhere are “interactive learning spaces poor”. This is a main dimension of learning divides.

The post-socialist countries are not rich from that point of view; moreover, some aspects of the prevailing type of growth tend to inhibit or even destroy some of those learning spaces. Elements of that structural change are firstly the trend to replace locally produced equipment by imported capital goods, thus diminishing national production of such goods; the diminishing role of engineering departments of several industrial firms; and finally dismantling of the R&D laboratories of many public firms after they are privatised. Katz (1999) suggests that similar trends could be observable in Latin America in the 90ies and I think probably we are witnessing here the emergence of a new style of technological development, less “domestically intensive” than during the period of the Socialist Industrialisation of the 50-70ies.

Main technological efforts of transformation countries, that in the 60-70ies addressed high-tech products, showed in the mid-1990s a predominance of medium-tech products. “Except for the Hungarian and later for some Czech and Polish export processing zones and vehicle and electronics

manufacturing, the region has very little more to show in terms of technological upgrading and international competitive high-tech industries. Moreover, such study stresses the outward oriented change of technological demand, by giving several examples of Central European high-tech firms that, after being bought by multinational firms, have abandoned the more complex and sophisticated activities previously cultivated. The respected studies often focused on few cases showing just the contrary. But the frequently repeated stories [f.e. GE-Tungsram in Hungary] shows their exceptionality. Clearly, that trend is not helpful for the expansion of “interactive learning spaces”.

The analysis offered for Latin America, an other periphery by Cimoli and Katz (2001), shows that outside of the hard core of international production networks many knowledge intensive industries have lost ground.

In any case, the tightening connection between inequality and capability building is a major issue for the region. Maybe connecting the concept of “linkages”, proposed by Hirschman for the development of industrial policy concepts of modernisation could be combined here with notions of national innovation systems.

Such examples of linkages should be the “innovative circuits” (Arocena & Sutz, 2000). They are defined as processes in which pressing problems of production are solved by the encounter of actors having the problem with “knowledge” actors – be they faculty teams, public laboratories or high-tech firms -, thus leading to joint work on related problems, in a sort of growing or virtuous spiral. “Interactive learning spaces” are situations – or stable networks – that favour the emergence of “innovative circuits”; conversely, these virtuous circles contribute to the consolidation of such learning spaces, and often open the way to the creation of new ones[....].

In innovative circuits we often witness the relevant role of “technological tailors”, that is, teams or firms capable of elaborating a knowledge-intensive solution “tailored” to the specific aspects of the problem under consideration, its scale and available resources. Solutions of this type, particularly when the problems are posed in small peripheral countries are not usually available in the international technological market. Analysts offer interesting cases of local innovation in some Central European small and medium-size firms [new software firms or pharmaceutical companies].

UNIVERSITIES- CHANGING FUNCTIONS

Universities of the region in framing those problems are experiencing substantial change and facing many challenges in their future.

Fundamentally, the greatest change that has occurred, certainly in Central

Europe, has been the considerable expansion of the system –in terms of student enrollment-conserving especially in the quality sectors the role of the state in influencing the higher education system . In the early 90ies, the universities still believed that now they will be at the very end very much in control of their own affairs.

In the 1960s there was a worldwide reaction against academic elites in favour of a democratisation of all institutions including universities. The very word university was seen as elitist, and in most cases universities were elitist because at that time only a small proportion of the available 18-24-year-old population went to universities. They were certainly elitist in the social and economic sense. As a result of the turbulence of the 1960s, many higher educational systems worldwide have increased access to higher education, though not always to degree-level education.

But the Central European universities isolated from those trends in a totally different socio-political environment [the Warsaw, Belgrade or Prague student movements of 1967-68 had direct political goals, specific university policy questions were only tertiary importance for them] are now confronted without the previous experience of co-habitation with the reforms with the new challenges.

University autonomy has been a critical issue in the definition of the place of the university in society in the early 90ies. Since those years debates about the possible, acceptable or optimal forms of dependencies and social service functions are much more frequent than issues of autonomy. At the same time the increasing participation in higher education is a valid response not only to the pre-89 critical movements but also to the growing needs of a more complex society. There is no doubt that society requires many more highly educated and skilled people to manage and develop our more technologically and sociologically complex society. However, although increasing the places available in higher education undoubtedly addresses this, many educational challenges have been created. This problem is sometimes referred to as academic drift, and is by no means confined to Central Europe.

A broad institutional typology covers the range of higher education provision, identifying at the top end the universities that award their own degrees up to and including doctorates, and are involved extensively in postgraduate education and further research, and toward the other end of the continuum those colleges and institutes involved mainly in teaching certificate and diploma courses and perhaps undergraduate degrees, and involved in very little research. Either the faculty, or the broader public-

including the perspective students and their families- were prepared to the emergence of mass university in Central Europe. Their higher education perspectives were based on their previous experience in surviving 19th century university structures of the region plus some fragmented and partial information about Cambridge, Oxford, or Heidelberg. After that pink fog of their expectations they were obviously shocked by models, organisational patterns, quality concepts and teaching methodologies introduced during the university reforms of the 90ies. Those West European university models of the 60ies which were copied in a certain sense in Central Europe in the 90ies were originally implemented in a period of impressive economic growth. But the 90ies in Central Europe are year of recession and slow recovery. The share of GDP channeled to the higher education in the early and late 90ies is almost the same, but the enrollment doubled in those years. Consequently, instead of the dream about transformation of late socialist teaching institutions into elitist “European” research universities the outcomes are factually new educational factories.

Perhaps paradoxically, society nonetheless seems to value the ability of universities and the profession of the university professor remains- according to the prestige surveys among the most prestigious jobs.

The perceived problems in this situation can be collected under four headings: the bureaucratisation of university functioning as a result of quality implementation; the individuality of the role of the academic in the university sector; the lack of clarity regarding the identification of the “product” of university functioning; the confusion regarding “customer” identification for the university sector. These four issues will be dealt with sequentially.[Buckley-Hurley,2001]

As the traditional expertise to facilitate this quality regime did not exist in most universities, a new wave of systems and administrative managers found a place in the university environment. The development and professionalization of this layer of non-academic systems managers came as a direct result of academic staff demands for such support when faced with the explosion of administrative form-filling connected with quality accreditation.

The development of such an administrative management layer to facilitate quality functioning, while not in itself directly restricting academic autonomy, does in effect increase the number of stakeholders involved in the university mission and dilutes the ideal of the university as a community of scholars. This redefinition of control within the university, with the increase in importance of administrative managers as pivotal stakeholders, may sow the seeds of potential conflict and fuel fragmentation for the nearest future.

Debates about “the product” of higher education accompanied the reforms. If student learning is to be taken as the principal product of the university, it must be stated that measurement of this outcome is fraught with difficulty. Is it reflected in student assessment and evaluation? Part of the answer must be affirmative but student evaluation on individual subjects and modules does not necessarily reflect the totality of the process of student learning, rather it is one relatively crude output metric[Buckley-Hurley,2001].

Pivotal to the confusion regarding the success of quality initiatives in the Central European university sector is the imported in the 90ies concept of the customer. Of course, in the university sector the identification of the customer is not so clear-cut. Doubtless the student is the most immediate recipient of university teaching, but the relationship of the student to the university is more complex than that of mere product recipient.

Universities of the region have been slow to elevate the student to the critical and powerful position of primary customer but with the increase in diversity of institutions delivering higher education and programmes within these, few universities have remained immune from repositioning their programmes to attract maximum student application levels. Given that students are the major and most essential units in the budget of any Central European university in this years, the current pressures to attract a greater proportion of high-quality students may result in universities marketing themselves to students by offering them what they “believe” they want.

We start with the fragmented learning as a possible initiative effect on quality of the learning systems in the investigated countries.

As organizations growth, the university could be regarded as a “high uncertainty” environment, with academics frequently working toward individually devised goals and somewhat ambiguous outcomes. With this in mind the implementation of knowledge production quality metrics in the university sector has often been perceived to focus on the evaluation of some details rather than reflect on the overall outcomes of what may be viewed as the grander goals of a university. When focusing on university teaching, the quality model frequently looks at student learning as the appropriate outcome metric, but in doing so focuses on student examination results to reflect the success of the teaching-learner endeavour.

Clarity of process of course is an intrinsic part of the quality paradigm.

Academics frequently find themselves having to deliver very defined modules and in defined time periods with considerable pressure to conform to the accepted delivery format. Possible quality initiative effect: driven by customer expectation rather than content excellence.

LEARNING IN THE SPACE- REGIONAL CLUSTERS

After a longer period of time, in which transaction cost explanations dominated the field of economic geography, the space and regional aspects of knowledge production reappeared in the literature in the 1970ies and 1980ies. Contributors to this field of “new economic geography” endeavoured to incorporate some ideas from evolutionary economics into the traditional conception on agglomeration of economic activity. In particular, the importance of institutions, innovation and learning for economic growth and development were core concepts here. Hence, during the 1980ies and 1990ies the “industrial districts” idea experienced resurgence as a large body of new economic geography literature claimed institutions and therefore innovation processes too to be spatial in nature, and thereby developing a knowledge-based approach of the study of regional economic development. Examples of this include for instance work on post-fordism and flexible specialisation (Piore and Sabel 1984), industrial clusters (Porter 1990), Industrial Systems (Saxenian 1994), the Learning Region (Morgan 1997), Regional Worlds (Storper 1992) and Regional Innovation Systems (Cooke 1992, Braczyk et al 1998) to mention a few. In addition, the “new economic geography” literature included a very large bulk of empirical research was carried out on various regions around the world.

Central to the understanding of the dynamics of location is the notion of proximity, and that of localised learning, where the existence former is a necessary condition for the existence of the latter. Gertler et al (2000) argues that innovation as knowledge production and utilization is fundamentally a geographical process for three main reasons. Firstly, spatial proximity encourages face-to-face contact, which again is a necessary condition for interactive learning. Secondly, proximity may also stimulate the creation of common cultural contexts, which also facilitates interactive learning processes crucial for innovation. In particular, this would be the case when a high degree of tacit knowledge is involved in the learning processes. This point bear some resemblance to the concept of collective knowledge discussed above, which leads us to the third point; namely that innovation is a spatial process due to the tendency of regional cultures to become institutionalised as rules of conduct, that govern the relations and interactions of economic agents within the geographical area.

Taken together, the three arguments incorporate much of what Storper seems to imply by his notion of “untraded interdependencies (Storper 1992). Thus, Storper explains the existence of synergy effects in the industrial district

with reference to the two concepts of traded and untraded interdependencies. In Storper's terminology, traded interdependencies are the formal transactions, the local input-output relations that take place between the economic agents in the region. Untraded interdependencies, on the other hand are the intangible assets of accumulated knowledge and localised learning of a geographical area that determines the direction of its development. The untraded interdependencies are present the crucial context for innovation and according to Morgan (1997, the notion is an improvement of Lundvall's concept of collective tacit knowledge, and a prerequisite for the effective function of the "learning region" (Morgan 1997).

Some scholars thought to export the marshallian industrial district model to Central Europe with the aim to identify those cases consistent with such development formula. Last but not least, former neommarshallian studies have begun to pay growing attention to learning processes occurring within local systems.

These two last lines of research have proposed interesting perspectives to study local development of knowledge utilization in the more backwarded and more developed regions of Central Europe.

The early debate of the 90ies , attempting to draw some conclusion from these policies experiments, addressed two main points:

- Firstly, State intervention financing predominantly capital intensive sectors, penalised labour intensive industries, largely prevailing among local manufacturing firms.

- Secondly, State intervention erroneously promoted sectors that were already in a restructuring stage when industrialisation strategies were implemented. Moreover, these industries had few changes to establish local forward and backward linkages, hence their contribution to local employment and more widely to local economy was inherently limited.

Debate revolved around the State-Market dichotomy, in between those scholars who could not imagine any autonomous industrialisation process without a strong State intervention.

A first point emerging from this debate suggests that Central Europe, and its societies should not be considered as a unitary socio-cultural entity.

Recognising that its regions constitute an heterogeneous area has led some scholars to suggest diversified policy interventions. In particular, some of them have argued that public action should first be addressed to those experiences that show higher propensity to enter 'high growth path' .

Further studies on local system have been conducted during the 90s. In these latter studies attention is paid to successful local systems, those that achieved a high degree of industrialisation or those characterised by

extremely high growth.

Above all, it is quite interesting that such literature, contrary to the earliest studies on industrial districts, emphasises the importance of external factors in affecting local development. External sources seem to have played a major role, not only supplying financial resources, but also providing strategic information about product and processes, norms and best practices. It is worth mentioning that some important steps in this direction were already made in previous theoretical contributions. They interpret the industrial district category as a ‘cognitive circuit, through which a local community (...) learns how to use the cognitive division of labour (...)’ and look at development in terms of ‘the cognitive processes which generate it, highlighting – though the theory – those processes through which knowledge is accumulated and transmitted’ (Rullani, 2000).

While explaining the importance of learning processes, we can argue that ‘industrial district’s development through imitation or integration may occur following different paths: pure imitation, migration, delocalisation and direct investment. In any of these cases, geographical proximity between imitated and imitating regions will foster all these processes (Viesti,2000: 33).

TRAJECTORIES OF TRANSFORMATION

In line with traditional catch-up theory and new growth theory, the opening up of the economy enables the transition countries to catch-up economically without investing as heavily into R&D as the already advanced countries, as it is much cheaper to build economic competitiveness on imported technology, which has already been developed elsewhere (e.g. Garschenkron, 1962; Gomulka, 1990). According to this view, it is therefore not a problem that R&D expenditures and patenting activities remain at very low levels in the Eastern countries. Gradually, when approaching the Western technological level, Eastern enterprises will begin to invest more heavily into R&D, take out more patents and thereby catch up with the West not only in terms of GDP and wage levels, but also in technology and innovation..

A common research strategy has in recent years been to estimate the links between foreign direct investment and the performance of domestic firms in terms of productivity and output. The results of these and similar studies vary. For example, Konings (2001) found a negative overall effect of FDI on the performance of domestic firms in Bulgaria and Romania and no effect at all on domestic firms in Poland, indicating that the expected positive effects on productivity of foreign investors as agents of technology transfer is typically more than outweighed by the negative effect of competition from

foreign-owned firms, destroying the potentially emerging local capacity to innovate.

A somewhat more interesting indication of technological achievements is obtained through the analysis of 'unit values', defined as the ratio of export value to physical weight. This is taken as a proxy for the value-added of exports; if the unit value of a country's exports exceeds that of its imports in a certain sector, the value-added content of exports is assumed to be higher than that of imports. This is then likely to reflect a quality advantage of exported goods over imported ones. The evolution of unit values over a longer period of time can then give a rough indication of technological change in a country. For example, Lankhuizen (2000: 22-24) applies this reasoning to the Baltic States, with the conclusion that unit values are lower for exports than for imports in most product categories and that the pattern is hardly improving through the mid- 1990s.

The socialist countries had in fact been well aware of the problems in their systems of innovation since long. As early as 1960s there were discussions in the USSR in which critics pointed at the inadequate linearity and fragmentation of the system and, fully in line with modern innovation theory, at the need to strengthen the links between different kinds of organisations, in particular between R&D production. Cooper (1982) has provided a detailed account of the numerous attempts at reforming the Soviet innovation system. In any case, there is hardly any evidence of actual improvements in the performance of East European innovation systems prior to 1989; the overall trend is instead a continuing decline in both generation and diffusion of innovation, which largely follow the general economic trend towards stagnation (e.g. Tournemine & Muller, 1996). In a few countries – in particular Hungary, and later Poland – more far-reaching changes took place. For example, the setting-up of small enterprises was seriously encouraged and enterprise-level cooperation with capitalist countries was allowed. These experiments and reforms certainly made the later transition to a capitalist market economy easier, but there is no evidence that they had any significant impact on innovative capabilities.

The existing empirical evidence on the actual effects of these radical changes indicate that the farewell to socialism has as a rule led to a dramatic collapse of large parts of the inherited R&D system (e.g. Radosevic, 1997). In particular, organisations engaged in applied R&D have not been able or allowed to adapt to the new situation, and the base for their funding by the state has usually been withdrawn. Estonia and Latvia have here been pointed out as extreme cases of shutdowns, as a large part of the R&D complex in these former Soviet republics had been subordinate to military ministries;

the market for their R&D services was therefore totally eliminated (Dyker & Radosevic, 1999). Organisations involved in basic research, i.e. Academies of Sciences and universities, have faced a relatively more continuous transition in most countries, although also for these organisations the financial resources and employment have decreased considerably. After 1989 hopes were raised about possibilities of strengthening East European academy-industry links (Dyker & Radosevic, 1999), but with the almost total disappearance of organisations in the spectrum between basic research and production enterprises, this is obviously contradictory to the actual prospect. However, there is hardly any actual evidence on the extent to which basic research in the surviving R&D complex has developed any connections to the emerging business sector; it is only indirectly.

In general, the R&D complex in East European countries has thus been radically downsized. Nevertheless, public research institutes and universities typically continue to carry out a majority of formal R&D. While in Western countries it is typical for the public sector to contribute with around one third of total R&D expenditures, while private firms contribute with two thirds, the situation is typically the opposite in Eastern Europe, where government-financed R&D amounts to up to two thirds of total R&D expenditure. From a historical point of view, this is hardly surprising, since nearly all-innovative activities were extramural in socialist systems of innovation, i.e. R&D and innovation were not carried out by production enterprises. The interesting aspect of the post-socialist development, however, is that there are no clear indications that the pattern has been changing since the early years of transition. This inherited expertise has to redeploy relatively quickly in order to prevent 'unlearning' (Radosevic, 1997). It is not clear however, to what extent this potential is actually being caught up by other (existing or newly founded) organisations, or is rather being lost through scientists finding employment in non-scientific activities or abroad.

Pavitt (1997) has suggested that the inherited socialist competencies became obsolete with the systemic change in the East, implicitly indicating that they are replaced by diffusion into the East of Western competencies. Bitzer (2000) has gone further and suggested that the socialist knowledge base and the socialist technological trajectories have not significantly influenced post-socialist innovation. In addition, and perhaps more important, Soviet-era history is embedded not only in technological trajectories and competencies, but also in organisational forms and institutional structures. It has thus been suggested that, for example, the formal or informal reintegration of socialist networks following their legal split-up (see above) may in fact play important roles in stimulating innovation. These networks may be able to

play a constructive role in the transformation and reorientation of the inherited systems of innovation, for example, by creating a critical threshold demand for R&D or by creating subcontracting networks (Radošević, 1997). In terms of output, measured in terms of the resident patent applications, we have already seen that there is even a widening gap between East and West. Sweden, Finland and Germany submit between 7 and 10 times more patent applications domestically as compared to the Czech Republic, Hungary and Poland. In terms of US patents, this gap is dramatically wider. The only CEE economies with any significant US patents, this gap is dramatically wider. The only CEE economies with any significant US patenting activity are Slovenia, Hungary and the Czech Republic, and even for these countries the gap to Sweden, Finland and Germany is between 13 and 73 times. While the Western countries have globalised the exploitation of their innovations by dramatically increasing their US patenting activities, CEE economies have not been able to follow this trend.

With the relatively large number of foreign investment projects in the Eastern countries, it is not surprising that we observe a large number of product and process technologies in Eastern Europe that are new to these countries, but there are strong reasons to suspect that these creations, though fulfilling the definition of 'innovation' in the Oslo Manual, are largely imitative rather than creative innovations.

This is an issue, which has not been addressed at any length so far for the case of the Eastern countries. The only study dealing explicitly with the issue of creative versus imitative innovation in Sandberg's (1999) analysis of Polish environmental technologies. Sandberg concludes that 'creative innovation' is 'still a phenomenon to hope for rather than to detect at present in Poland'. Geenhuizen (2001), with a somewhat similar interest but distinguishing between 'static' and 'dynamic' learning, finds that prospects for 'dynamic learning' in the context of foreign investment in Eastern Europe still appear to be very limited. Similarly, Sadowski (2001), in his study of cooperative East-West ventures, concludes that cooperative agreements are associated with a decreasing rather than increasing innovative capacity in Eastern firms, at least in technology-intensive sectors. This is in line also with Radošević's (1997; 1999) argument that R&D

activities in Eastern firms are strongly skewed towards downstream non-R&D activities like testing and standards, as these are now critical for exports.

NATIONAL AND METROPOLITAN CLUSTERS OF KNOWLEDGE GENERATION

In a newer text work, Porter (2000: 254) defines a cluster as "a geographically proximate group of inter-connected companies and associated institutions in a particular field, linked by commonalities and complementarities", while also stating that the geographic scope of a cluster can "range from a single city or state to a country or even a group of neighbouring countries." Using the Porter-metaphor in areas of knowledge production on one side instead of companies we should speak about To answer this question one may distinguish between the horizontal and vertical dimensions of a cluster and identify the advantages of local or regional as opposed to extra-local or inter-regional interaction between firms (Maskel 2001, Bathelt 2002).

The horizontal dimension of a cluster consists of those firms that produce similar goods and compete with one another. This dimension can play a decisive role in the early stage of cluster formation and specialisation.

Porter (1990, 1998) has demonstrated that strong competition and rivalry between firms is an important incentive for innovation and product differentiation. Advantages of proximity thus arise from continuous monitoring and comparing. Due to their co-presence, the production conditions are basically the same for all regional firms.

The vertical cluster dimension consists of those firms which are

complementary and are inter-linked through a network of supplier, service and customer relations.

once a specialised industry cluster has been established, the firms of this cluster develop a demand for specialised services and supplies.

However, it has been well-known for a long time that clusters and agglomerations are seldom characterised by strong internal input-output linkages. This modest importance of regional input-output linkages has been confirmed in many studies of older industrial regions, as well as high-technology production spaces (Chapman and Walker 1987).

Recent contributions by Storper (1997), Lawson (1999) and others have pointed out that the existence of economies of scale and other kinds of traded interdependencies are simply not enough to understand the processes behind spatial clustering. In emphasising 'localised capabilities' and 'untraded interdependencies', it has been shown that socio-institutional settings, interfirm communication and interactive processes of localised learning play decisive roles in processes of innovation and growth (Maskell *et al.* 1998, Bathelt and Glückler 2002).

Overall, the shared knowledge basis enables cluster firms to continuously combine and re-combine similar and non-similar resources to produce new knowledge and innovations.

Again, Marshall (1927) expressed this in his famous notion of 'industrial atmosphere', as being something that is 'in the air', limited to the people within a particular region or place.

Marshall's 'industrial atmosphere' concerned the industry-specific cluster advantages usually referred to as 'localisation economies', but his general idea has lately been taken up and extended to become a more general statement about the advantages that may accrue from the geographical propinquity of industries and services in general ('urbanisation

economies').

Buzz refers to the information and communication ecology created by face-to-face contacts, co-presence and co-location of people and firms within the same industry and place or region. This buzz consists of specific information and continuous updates of this information, intended and unanticipated learning processes in organised and accidental meetings, the application of the same interpretative schemes and mutual understanding of new knowledge and technologies, as well as shared cultural traditions and habits within a particular technology field, which stimulate the establishment of conventions and other institutional arrangements. Actors continuously contributing to and benefiting from the diffusion of information, gossip and news by just 'being there' .

This sort of information and communication is more or less automatically received by those who are located within the region and who participate in the cluster's various social and economic spheres.

Being located in the same place also enables firms to understand the local buzz in a meaningful and useful way. This is because co-location within a cluster stimulates the development of a particular institutional structure shared by those who participate.

Actually, an increasing number of studies have begun to question the seemingly dominant character of local learning processes (Bathelt 2002, Gertler 2001). Oinas (1999: 364), for instance, finds that "[t]here is relatively little research on 'actual learning processes' to give support to the claims about 'localised learning'.

Owen-Smith and Powell (2002) use the term 'pipeline' to refer to the channel used in such distant interactions. Decisive, non-incremental knowledge flows are often generated through 'network pipelines', rather than through

undirected, spontaneous 'local broadcasting'. Boston's biotechnology firms are thus not only embedded in regional innovation networks but also in social networks which are not defined geographically.

The extra-local knowledge flows (through the pipeline system) and the local buzz are mutually reinforcing. The more knowledge producing agents of a cluster engage in the built-up of trans-local pipelines the more information and news about markets and technologies are 'pumped' into internal networks and the more dynamic the buzz from which local actors benefit.

From a study of a larger number of industrial clusters in different parts of the world, Bresnahan, Gambardella and Saxenian have, furthermore, found that the reasons behind the establishment of a new cluster are much different from those which support the growth of an existing cluster. Outstanding entrepreneurial activities, their willingness to take the risk of starting up new ventures and their ability to tap into new areas outside the established technologies and markets have been decisive for the genesis of those clusters studied.

Another group of studies emphasises the need of extra-local linkages by referring to the dangers of local networks that are too close, too exclusive and too rigid. From a different point of departure the literature emphasises the importance of those actors which are able to make connections between otherwise remote networks. These are non-redundant linkages which bridge 'structural holes'. We can refer to these network relations as 'plumbing' through which information and resources are being transmitted.

Overall, communication processes in global pipelines are contingent by nature and are

plagued by great uncertainty. Common institutions are established that enable co-operation in particular projects. Because global pipelines encompass firms from different parts of the world which are embedded in different socio-institutional and cultural environments they operate in multiple selection environments (Owen-Smith and Powell 2002). This is particularly important in innovative industries where leading-edge knowledge constantly changes and new and better products and processes evolve. That argument carried out is at odds with Granovetter's (1973) classic work on the strength of weak ties. Therein, Granovetter (1973) has illustrated that strong ties are rarely able to bridge the gap between different networks. He points out that particularly weak ties are able to bridge the gap between networks and, thus, allow one network to source new knowledge from another. In accordance with Granovetter (1973), we suggest that weak ties at the periphery of a network are especially important for the diffusion of breakthrough innovations which would otherwise be slowed down by strong ties in the network core.

Identifying the value and location of external knowledge and building pipelines to access that knowledge is, however, only part of the challenge when attempting to boost a firm's innovative capability. An equally immense task is to establish the ability to assimilate the information arriving through pipelines and to apply it successfully towards commercial ends. Cohen and Levinthal (1990) have labelled this ability an institutions 'absorptive capacity'.

An institution's absorptive capacity depends on the firm's direct interface with its local environment and on the number and extent of its pipelines. It also depends on the way in which information can be transferred across and within departments and sub-units which may be removed from the point where the pipelines enter into the firm. The role of internal gatekeepers and boundary-spanners becomes crucial for translating externally produced knowledge into a form that can be

internally understood by the departments or individuals for whom it is particularly valuable. In this sense absorptive capacity can be seen as a mediating variable between the institution's environment and its organisational adaptation.

Therefore, a strategy which aims at developing a coherent internal knowledge base to cope efficiently with acknowledged problems bears the risk of having too little heterogeneous knowledge to be able to fully understand and take advantage of knowledge available through the pipelines.

This analytical framework can be given a dynamic twist when investigating the reasons behind historical and path-dependent differences in knowledge production and institution's innovative performance.

The majority of policy ambitions and initiatives are directed towards encouraging and developing mechanisms that promote the potential for interactive learning and knowledge creation across firms and other organisations within a spatially defined cluster. The arguments put forward in this paper partly question such initiatives. The local buzz is certainly dependent on particular local institutional preconditions but the important point is that it largely takes care of itself. If a number of actors are placed within a region some sort of buzz will automatically result (even in prisons, where the inmates are kept apart from one another in order to limit information spill-over, a lot of buzz occurs). In contrast, it is especially the development of global pipelines which requires institutional and infrastructure support. Perhaps it would be wiser for policy actors to consider the possibilities of stimulating pipeline development rather than to make extensive efforts in generating and promoting local buzz through various forms of social engineering.

POLITICAL ELITE AND SOCIAL SCIENCE EXPERTS IN POST-SOCIALISM

The management of social science expertise in post-socialist transition- with few exceptions [KRASTEVA, 2000; KENNEDY, 1997, TAMAS, 2002]-has not been seriously examined in the academic literature, and the study of

expertise by academics has generally focused here not on structural, but on the individual [ASHTON-ASHTON,1995; LIBBY-LUFT,1993], or team level [e.g. RICH-SOLOMON-TROTMAN,1997]. The traditional sociological literature on expertise on one side underlines the importance of the skill problem, and on the other side foundations of expertise are understood mainly as a power issue. In this chapter I try to concentrate on questions related predominantly to those power problems. This paper builds on the new statism literature and extends the study of expertise by examining it as an attribute of professional organizations, not just of individuals.

The traditional explanation of the "state weakness" in post-socialism of the early 90ies that this is an artefact created by ideology-driven neoliberal advisors and scholars, planners of the "market reforms". If that would be the case, the East and Central European transformation would be one of the very few contemporary societal actions where a relatively small group of intellectuals- with some help from outside- were really efficient. Using pure ideological concepts they were able to persuade the local elites and change the substance of the state power. This is a nice and easily contestable mythos, but a misleading interpretation of both actors', the elite's and the expert's behavior. On the opposite, one thing is clear, that- exepct Poland for a very short time- nowhere else have "neoliberals" occupied leading positions [GANEV, 2001,9]. At the same time, devolution of state power is observed in different forms and magnitudes all across the region.

Comparative studies of state building in different regions could help to understand the elite's behavior and its interest or non-interest in particular agencies or a coherent institutional framework of governance in different periods of transformation. But, simplifying the story in the early 90ies the dominant project of the local elites was disintegration, fragmentation and privatization of the state-economy inherited from state socialism. The "extraction" using a Tillian term [TILLY, 1992] took place confronting not other social strata with divergent interests, but former state structures and bureacrats trying to control formally or informally fragments of that economy. Weakening the state for that moment was something basic for the new [very often emerging among late socialist technocrats] and "neoliberal" expertise was either the impetus, or the major tool to dismantle the state, but a language, an internationally accepted discourse to present personal interests as "good society". At the same time it was more then simple ideology. Using that type of expertise they introduced certain analytical schemes, models, even a practical framework limiting from a broader

perspective certain voluntary actions destroying the economy. In the late 90ies the stabilized social and economic order forced implementation of other rules of "extraction", those which were closer to the original vision of Tilly about state coercion. GANEV, 2001 speaks in this respect in the early 90ies about a "reversed" Tillyan model. Discussing events in the late 90ies of Central Europe, emergence of a "postponed" Tilly-type state building strategy seems for me more plausible as explanation. The changing dominant project of the elite in this phase would be that what we call now "neoetatism". The changing paradigm of social organisation forced to change the experts, and the most visible part of the discourse, as well.

We would be unable to present in realistic terms the role of expert knowledge in the post socialist state formation if following MANN[1985] don't develop a key distinction between the "despotic" and "infrastructural" elements of state power. Despotic power he defines as "the range of actions which the elite is empowered to undertake without routine, institutionalised negotiations with civil society groups". But there is an other dimension in which people talk about the power of the state and he terms it as "infrastructural power, the capacity of the state to actually penetrate civil society, and to implement logistically political decisions throughout the realm". The two analytically autonomous dimensions of power may be, in practice, interrelated. According to MANN [1985,344] state infrastructural power derives from the social utility in any particular time and place of forms of territorial centralisation which cannot be provided by civil society forces themselves. The extent of state despotic power derives from the inability of civil society forces to control those forms of territorial-centralisation [MANN, 1985, 345].

We don't extend the analysis to contrasting cases of communist legacies showing the different heritage in that respect of such diverse regimes, as the national accommodative communism in the Hungarian and Polish case, and the bureaucratic authoritarian communism in the case of Czechoslovakia.¹ Critical social scientists and party reformers in Hungary, ex-communist and Solidarity activists in Poland both believed in state reform as a guiding principle. The internal opposition and the political forces from the established elites competing with to orchestrate the changes under national accommodative produced credible pro-reform technocratic elites on both side of the reform divide after 1989 [INNES,2002]. The regime stagnation of Czech bureaucratic authoritarian communism precluded the development of

¹ See KITSCHOLT et al, 1999

reformist cadres in the political elite and technologist of the state reform were practically absent among opposition's intellectuals, as well. The elite of the 90ies was constituted from "grey-zone" professionals [research economists] of the last communist decades opposing state-democratic reforms. When later the Czech elites started to develop concepts of the state reform in a strange sense they were free: either prior ideological commitments or a mobilized electorate interested in those issues were present.

In the Czech case the national elite, or the centre has protected itself during devolutive state reforms from contestation of the periphery using electoral laws for the regions then ban independents from running [INNES, 2002, 35]. Czech mainstream parties seems to believe that local governments may entail civil benefits, but nor political ones. The political message of the Czech reforms are that significant political power should remain at the centre and controled by the national elite. Hungarian public governance philosophies, ready to support in many other areas genuine devolution are quite similar to the Czech ones concerning in that particular respect. We see that even in Poland, where local social and political forces in the big provincial cities were much stronger then in Hungary, or in the Czech Republic, the willingness to relocate authority to the periphery appears as a liberal constructivist elite model.

Even there, where state reform is apparantly motivated by the genuine intention to disperse power, conditions of liberal state development are different from their original counterparts in the West [INNES, 2002,38] and in that sence our state reforms are naturally constructed. Of course, the constuctivism opens gates and creates more space for experts. Where ideologies are present [and in Central Europe still this is the case] and where there are only few organic power centres beyond the political class and a partly depending on them national economic elite ready to articulate their interest in an efficient way, the expert power starts to emerge. The political elites generating their own or importing societal visions are usually weak in technical details. If you can persuade them, that the suggested by experts solution serves their constructivist view about the good society, and very often its quite easy to start having their support. MANN's vision relates to the ways in which despotic power of state may be increased , and the Central European stories would seem to reveal quite different civil society capacities to monitor and participate in the changes. However those dramatic differences of the early 90ies [which created in those years different spaces for experts, too] became due to the de-mobilization of organized social critics to a certain degree started to disappear. Analysis of tripartite

arrangements in this countries indicates instead of a new corporativism only the prevalence of illusory corporativism [OST, 2000]. Token negotiations and non-binding agreements demonstrate the state power in this sphere. Again where other players are non-existing, or if they are there, but their agenda is nor really present, the political class becomes to autonomous and that autonomy is easely manipulable by experts. Here in technical sense the the power of the political class is expert power again.

The literature on transition of the first decade is dominated by neoliberal explanations. Where transition has been successful, according to this basic model, interventions were quick and institutional reforms limited the rent seeking ambitions of the state. However, the empirical evidence available since 1989 tells an other story. Even in the betted performing countries of transformation the bureacratic elites retained significant influence in the economy and even more the state [governments, the public administration] have constructed economic empires depending on political support not only in their infant stage of development.

When analyzing functioning state in post-socialism, its important not to exaggerate its rationality [SCHOENMAN,2001,2]. The story discussed by us is more complicated than a simple contraposition of market-based against state-based solutions. In some areas of policy-making the state is both autonomous and an arena of the involved actors'[politicians, experts, sectoral elites] self-presentations. The outcomes of sectoral policies have been both results of interests as much as planned state action. Social science expertise in those networks is understood as translation of those interests into discourses, logics of action of different sides.

Therefore, debates of the early 90ies about "how much" states intervene have been replaced with arguments about "what kind" of involvement is [would be] more efficient in the given social settings. Of course, from the perspective of a systematic sociology of expertise the differences in behavior pattern, networking capacities, and intellectual styles between experts of "dirigiste" and "liberal", or "interventionist" and "noninterventionist" states are still relevant. But for the state-brokered development analysis [EVANS, 1995,10] this is almost of secondary importance.

Often comparisons between post-socialist states and the East Asian NICs ara used as a point of departure for reflecting on the state in Central Europe. But differences in the mechanisms of state intervention of the two regions are significant. The NIC state is understood as competent, able to mobilize key resources and in certain periods even representing long-term national interests. The post-socialist state until the late 90ies had less accessible

funds to invest and social partners view it as lacking the necessary technical skills needed to manage major societal or economic breakthroughs. That confidence problem creates special space for experts from Academia in the state-business networks and joint programmes. Here the expert as confidence-builder for the "unable" state becomes a quite often the central role for policy intellectuals.

Following EVANS we refer to the structure of relationships between state and economy as a combination of autonomy and embeddedness. In his analysis embeddedness is institutional; the actors revolve around the the same institutions. But, in the post-socialist case institutions change and/or remain fuzzy and embeddedness arise from more idiosyncratic relationships. The autonomy of political class is also limited, or even hard to identify it as such due to the strong dependency of personal career paths in the state apparatus on external factors [roles in political parties, additional personal income from non-state, or non-state related sources]. But the state autonomy is also limited on the institutional, or structural level. In the 90ies the political parties usually attempted to form a class of their own entrepreneurs, ready to serve as cash engines for political competition. Part of their experts therefore has a double function to be involved into strategic decisions both in state and business structures enforcing co-ordination and synchronizing them. But rapidly changing political conditions, quick ups and downs in fractions of political elite and systematic electoral defeats of ruling parties due to large protest potential of population question to loyalty of economic "partners". In principle, economic actors should pay tribute to their political "patrons", in exchange for the privileges positions they have been granted. But usually replacements- structural ones by changing institutional access of a given party to the power, or personal ones through new nominations to decision-making positions- makes those relationships for longer [or just not very short] time horizons fragile and hardly calculable. The experts involved into stabilization exercises of those networks very often forced to choose between partners. Some of them remain party-bounded following in and out their political clients [or patrons in some case] in the political apparatus. Others becoming societal contact persons of the business representing them in co-ordinative functions with different political actors [parties, movements, governmental agencies]. The third option: stabilized sets of experts in the given institutions binding or overlapping the governance by different elite fractions is very rare even among technical specialists and almost non-existing in groups of social scientists.

Interest representation between business, social actors and the state is not using business organizations or formalized councils of co-ordination with

social actors [although many such organisations exist] as a major avenue and usually based on arbitrary collusion.

ADVISORY INSTITUTIONS IN POST-SOCIALISM

Social science advisory institutions may be classified into three distinct types. *Knowledge units* are selective in their choice of clients and attempt to develop proprietary knowledge to meet the more specialized needs of such decision makers [GIBBINS-JAMAL, 2001]. These units are highly socialized with limits on partner autonomy, wide distribution of expertise within the unit, and use of re-training and systematic strategy building rather than reliance on decision making aids and tools. *Full service units* usually are just opposite, providing general professional knowledge to a broad and undifferentiated clientele. Those think tanks are more entrepreneurial, knowledge is concentrated there in a few experts, and are with wider latitude for partner autonomy. A third type, the *relationship firm*, combines some client selectivity with some entrepreneurial operating style [GIBBINS-JAMAL,2001,2]. The organisational, or institutional differences between the units are more important, than the content of the expertise itself.

In the literature about academic impact on policy processes expertise is generally considered to be a characteristic of a person, and not of an organisation. If we understand the expert unit as an organization competing with similar others among politicians and policy makers then according to PORTER,1980 long-run survival as above-average financial or power-fueled profitability can occur only if a unit has a sustainable competitive advantage. According to Porter's framework a firm, or unit creates competitive advantage by being unique or the best at delivering some service valued by clients. On the post-socialist policy markets uniqueness of experts is generated in different forms by the combination of empirical data offered by them, the trust of politicians to open themselves to these particular experts as the Others and the communicative abilities in selling professional information to non-professionals.

STEWART,1997 proposed that a firm wishing to add value perceived by clients can develop two types of knowledge: general professional [sector-wide] knowledge, or proprietary [firm-specific] knowledge. For the social science advice that could be translated into area-specific [media, education], or agent-specific [e.g. focused on the socialdemocratic clientele] knowledge. Some texts suggest, that the firm should build-up one or the other type of knowledge. But in the post socialist expertise both types should [and in fact were] quite often generated- however in different proportions -in the same organisations at the same time.

In the early 90ies both types of organisation, or knowledge generation existed paralel on the policy markets. The sector-wide knowledge producents were usually surviving late-socialist institutions, pre-1989 supporting the state governance in the given sectors and in some forms financed by it. Part of those were even somehow integrated with related academic R+D programs. They controled the accumulated in the previos decades policy knowledge of the area, and in some cases those major established think tanks [e.g. in Hungary the National Institute of Public Opinion Research, the National Institute of Agricultural Economy, or the Educational Planning Institute] financed basic research and national library collections in the given field. But they were too big [most of them employed between 50-100 people] and too expensive for the bankrupted governments. Due to the R+D budget cuts most of them were destroyed or seriously damaged until 1995-96. In the Czech Republic they were closed almost totally, in Hungary some of them survived as independent, or academe-related institutions, and in relative terms the Polish institutional network was damaged less then the others. Governments and public institutions were often fighting for their physical or moral survival, interested exclusively in actual, or short turn policies. Systematic local institution building was almost everywhere replaced by institution transfer from the West. Maybe even in those years some politicians continued to believe in the necessity of local policy research but the foreign developmental aid packages financing the transfer were usually not interested in support of any additional local work. In some cases a sort of national policy market emerged even in those circumstances but the demand was unable to generate the necessary profit for organisational survival of the network. The dominant science policy discourse of that time made the existential fight of old policy-related institutions even more hopeless. In the early 90ies, in a period of decreasing performace of national economy the university-based research hoped to be stabilized by takeover of research funds and establishments in the "sectoral research", in industrial research institutions. Instead of integration with large firms, or tailoring a modern knowledge service sector from them usually those units were closed and their budget means -anyhow mostly killed by the dramatic inflation -were transferred for "stabilization" of the university sector. During the conflict both sides blamed their opponents as "Stalinists" but the outcome of the fight was dependent not on the labels [both structures were equally products of the state socialism], but their lobbying potential and in this the universities usually mobilizing the national media were much better. The fight was focused on industrial research were as the universities believed the money was available, and the social science policy institutions

were destroyed, or weakened here just as a by-product of that program. At the same time two other types of knowledge producing organisations were entering into the market. The first was mostly not policy, but politics-bounded. Political parties tried to create advisory boards, committees, ad hoc expert bodies and dependent "NGOs" or funds for their needs. Usually those units were small, weak, and only in parts used for real expert work. Their role was much more significant in "feeding" [not only metaphorically, but in the primer sense of the world] the hard core of party activists. Fees, royalties and tantiems were used to pay for mostly badly documented knowledge production or data collection, but under existing taxation it was easier to use those chaneln then other means to keep the party alive. The advisors were formally in most cases not legally employed there. Well-known academics, or public intellectuals included into the committees were here used and paid not for policy work, or political scenario building of the party but for its legitimation in the public eye. Being weak intellectually and from an organizational point of view, however, later, from the mid 90ies those structures became really important.

The second type of knowledge generation units was a direct and in most cases temporary product of transformation. A significant group of public intellectuals or just young social scientists beyond walls of institutions were active in the public social critics of the late state socialism and quite often they played a more or less active role in organizing collective action against it. Some of those people were incorporated into the new political elite, but most of them not. On the other side of Western non- governmental organisations, funds and programs entered into the scene hoping to support the transformation, or at some point even to influence it. In their eyes the state, and its knowledge producing institutions inherited from the late socialism were too rigid, expensive and anti-reformist in their spirit, therefore they were in most cases excluded from the co-operation. But, of course, the main ambition of those foreign funds and programs was not modernization of the knowledge production in its own frames, but democratization of the society [we don't discuss here those fuzzy concepts of "democratization" integrating different aspects of Westernization, modernization, political institutional and market building]. Applied social science and social science expertise was understood as a major tool for re-education and social change. The transparent and well-structured policy-making process has been recognised by the donors as an important guarantee of sustainable reforms. An additional key argument of Western advisors of that time, that post-communist capitalism lacks key ingredients of the normal capitalist society, and the job of technical assistance is to fill the gaps

[KENNEDY, 1997,31]. Foreign advisors looked for local offices, support assitancy and local intellectual guides and part of the early legitimacy of the think tanks was connected to their presense in the country and especially in those institutions. However, the emerging hidden[?] antipathy surrounding the foreign advisors² in many local policy environments damages the long term sustainability of the independent units. The targets of those new projects and programmes were not the elites, but the broader society. Siginificant part of those institutes were in ideological terms liberal³ and their relative failure and disappearance is partly related to the decrising importance of liberal parties in the political landscape of the region, so promising still in the early 90ies [which was quite understandable having in mind the "weak-strong state" changes in the political programmes. In the early 90ies- used for synchronising liberal reformers and their western patrons they were in some countries intensively used for drafting reform policies [the CASE worked with the Balcerowicz team in Poland, the Sofia Center for Democracy drafted peaces of legislation for the Bulgarian Parliament, etc.]. But with the disappearance of their clients from the big politics most of them were simple marginalized. Paralel to the decision makers the expertise was offered here not only to other elite groups, but to social movements and counter-elites of the civil society. Usually staff members of different chapters, units, local founds and institutions established by Western donors were selected from that anti-statist, radical intellectual milieau which couldn't be really integrated into the new political scene, but after the collapse of the socialist Ancien Regime was searching for new societal goals and tried to identify themselves with new tasks. The roles of the applied researcher, the public intellectual and the policy expert were here not really separated and most former social activists involved into the new networks were no institution builders and even very often bad managers. However, especially in the early 90ies these organisations offered higher income and more contacts with the outside world then the state sector and attracted ambitious young men and women with roads to the "new society". But despite of those circumstances the new institutions were quite instabil [different founds and projects were entering and leaving the scene] and there was very little hope to their survival on their own. The whole scene was created not only in an isolated from the existing [state] institutions

² in the Western media the foreign intellectual aid represented by the advisors, has been, for instance called "the most precious gift America has to give them" [to Eastern Europe]. Weinstein M.W.M.: Not a Yawn-Real Help" New York Times, January 30, 1991

³ In a list of East European think tank by the Freedom House in 1999 [KRASTEVA, 2000] 31 institutions were using in their names words like "liberal", "reforms", "civil", "democratic", "free market".

space but even demonstratively against them⁴. At the same time the institutional support- beyond the growing share of the Open Society network of George Soros- was usually not big enough for the infrastructure building. Around 1995-97 -at least in Central Europe- parallel with the improving social conditions- the Western democracy- builders started to leave. Until that point usually no serious steps were done for the integration of their informal research and policy archipelago into the existing national institutional order. Part of those dissipating institutions together with their staff disappears, but a smaller part becomes incorporated into the stabilizing party policy [firm-specific] networks⁵. The surviving independent counter-elite institutions, especially in the less successful transition countries, are still fully foreign-aid bounded⁶. Nowadays they are integrated more and more in networks with similar organisations from the region by the international projects or the donors themselves [KRASTEVA,2000]. On one side they present a new level of globalization in the policy business, but on the other side at the same time they represent its weakness, superficiality, or even reversibility in a certain sense. Their high visibility in the early 90ies could be interpreted as result of an experiment injecting the American policy-making culture to Eastern and Central Europe. However its major dimensions - fragmentation of the political power into a system of complicated balances and counterbalances, the weak party system, and the philanthropic tradition were not only absent in the local traditions, but were opposite to the national state or supranational bureaucracy-based policy development in Europe of the 90ies. Or in other words, being anti-Keynesian in their economic philosophies and pro-Washington- consensus [presenting liberal orthodoxy] in their developmental scenarios [KRASTEVA,2000] after a short period of "heroic" resistance they failed or were partly destroyed together with those public philosophy concepts which were represented by them. Their contacts with local and in the early 90ies still liberal media in some places [e.g. Bulgaria, Hungary] postponed their dramatic weakening but the neo-liberalism of the late 90ies made that process almost irreversible everywhere.

For a short period, in the late 90ies, the party based institutions are the

⁴ Therefore their impact on decision-making is not too serious even in those years [STRUYK,1999].

⁵ In the "Think Tanks in Central and Eastern Europe- A Comprehensive Directory 2nd Edition. Washington; DC. Freedom House, 1999" 101 independent non-profit policy institutes are listed.

⁶ In some countries, e.g. in Bulgaria, Slovakia, Romania, and Ukraine the Soros Foundation took over the financing of some formally non-state related expert groups. However their slogan "Assistance to Reform governments" is not too realistic. New governments are quickly replaced by even newer ones with opposite political programs and all of them- post-liberals, socialists and conservatives follow similar schemes- and establish their own policy-support networks.

dominant forms in think tank building. The basic human experience in those years in the Central European political class was the deep distrust to almost everybody, especially to those who were not fully belonging to "us" or even worse if they represented an other political tribe. The others were understood not only as -non-allies but as potential enemies. Everywhere in Central Europe in the 90ies governments were created by one and replaced very quickly by an other party which was again pushed aside its political opponents. Despite the frequent changes in many countries a certain type of stabilization in to bigger political blocks took place. Those bigger coalitions were building up- using the periods when governing- their own political subelite- experts, administrators, media people. And vica versa, those subelites defending their own job and influence markets were trying to stabilize the political confrontation between their elite and the elite of their competitors. Invited academic experts in those networks and units were usually old "comrades" from the Left or from the Right often with specific ties to the political leaders and trust was not only the result of common experience or joint actions, but usually a major precondition of the expert's involvement in the policy making at all. Step by step that firm- specific [party-oriented] knowledge was enriched with sector-specific knowledge, but for those political forces, which were in opposition at the given moment the integrated was quite often a very complicated exercise.

In the third period started from 1997-98 big political blocks became stabilized and they tried to build up their networks of advisors and policy institutions, as well. Integration of the sector-specific and party[firm]-specific knowledge production in to more general networks becomes high priority on the political agenda. Enlarged state budget, local sponsors and growing demand for international [EU, NATO, OECD, etc.] expertise are stabilizing the new knowledge producents. However in those partnerships the client is usually stronger then the expert. In most cases the expert is selected by its clients and not selects. Maybe the expert would be interested in a more high-margin or a broader diversified clientele, but the client selection decision is not his. If he/she is in the more politics-bounded part of the market, then he/she forced to follow the trust networks of big political blocks, or even the internal frontlines or structures of personal patronage inside of those blocks. If he/she is a policy expert then he knows that in most areas in the relative small respected countries the number of those policy makers [institutions] who are not only interested in his/her services, but ready even long run to pay for them is limited. Areas where large private corporations would be also interested in broader strategic advice [media, innovation, advertisement, some environmental issues] and therefore the

expert's selection choices are better are still not too numerous.

These strategic choices facing a unit [think tank] with deeper interest in social science expertise can be represented in an expert-client strategy matrix. The axes here represent the space for client acquisition and the type of knowledge developed. Their intersections create four major strategies:

KNOWLEDGE PRODUCTION MATRIX

Space/knowledge	Political actor-specific knowledge	Sector-specific knowledge
Rigid client selection [no space available]	Overpolitized, national [no markets]: KNOWLEDGE STRATEGY	Public administration dependency: FULL SERVICE STRATEGY
Flexible client selection [space available]	Cosmopolitan choices [international organizations]: RELATIONSHIP STRATEGY I. [non- market]	Multi-actor markets [national, international]: RELATIONSHIP STRATEGY II. [market]

There likely are regional variations in clientele, but we deal here with units operating on the national level [and in most cases in the capital cities] and we note that these are defining types. Empirically our knowledge producing units [think tanks] may show some mixed strategies.

In the early 90ies the social science expertise was almost in all spheres processed as a predominantly individualistic exercise, frames for the organization of that knowledge were ad hoc, temporary, or even if they were more stable, then only of secondary importance. But, during the decade the organizational frames became more important and the expertise was transformed from a mainly pre-professional exercise into a basically institutionalized and professional one. In units following "Knowledge Strategy" the organizational framework created and maintained by the political partner and the experts contact as individuals the political organisation, but in the other cases the expert units became an independent actor accumulating and pre-selecting the existing knowledge on the market. In that sense the expertise managed more and more as a strategic firm level property. Therefore a certain relationship between unit strategy and expertise management simply exists and could be presented in empirical investigations.

Different strategies may develop different expertise management structures:

EXPERTISE MANAGEMENT DIMENSIONS

Expertise management dimensions	Knowledge strategy	Full service strategy	Relationship strategy I.	Relationship strategy II.
1.types of expertise	Closed	Closed	Open	Open
2.partner autonomy	Low	In between	In between	high
3.partners compensation	Not actual project-related	Fixed, ofter institutional chanel	Team or firm bases	Individual, unequal
4.expertise diffusion	Concentrated	Partly concentrated	Diffusion	Diffusion
5.training	Centralized	Centralized	In between	In between
6.data dependency	Low	In between	High	High
7.academic contacts	Low	High	In between	High
8.control mechanisms	Strict	In between	In between	Relaxed
9. formalized tools for policy analysis	Almost never	Some times	Often	Often

From the efficiency point of view policy expertise could be analysed again in a matrix of impacts. The axes here would be centered around directness of influence and paradigmatic- non-paradigmatic strategies offered by the expert unit.

IMPACT STYLE MATRIX

Paradigm /impact	Direct impact	"atmospheric" impact
New paradigm generation	Confrontation	Changing winds
Broad opinion preservation	Active pluralism	Passive pluralism

On one hand, in the "narrow" sense "influence" can be defined as direct impact of expertise on particular [strategic or legislative] decisions. On the other hand, in the broader sense the influence is interpreted as the ability to change the dominant discourse about the issue without presenting alternative solutions for that moment. Following JAMES, 2000 we will call that influence "atmospheric". From the point of the content again we see situations where influence would be "the power to change the prevailing consensus of to preserve the existing climate of opinion" [STONE, 1996,110].

From all scenarios the "confrontation" impact style is the most militant one [direct impact X new paradigm generation] and the "passive pluralism" could be interpreted as the softest model ["atmospheric" impact X broad opinion preservation].

Both matrixes present different types of knowledge agencies with diverse mixtures of utilized knowledge and functions of expertise. For further analysis in applied knowledge packages we speak about structural [social science related], human ["who able to do what?"] and managerial knowledge ["via which paths could be our goals reached?"]. Among functions of expertise "political research&development" [production of policy relevant social research results], "knowledge diffusion" [trasmission of existing paradigms to new applications] and "legitimation of political actions as justified and solidly prepared" should presented as ideal types. The * - *** continuum indicates the presence of given knowledge types and functions in the given model:

FUNCTIONAL COMPOSITION OF STRATEGIC EXPERTISE

	Structu- ral knowled- -ge	Human knowled- -ge	Mana- gerial know- ledge	Political R&D	Know- ledge diffu- sion	Legiti- mation
I.						
Knowled- ge strat.	*	***	**	*	**	***
Full service	**	*	***	**	***	**
Relation- ship I.	***	*	***	*	***	*
Relation-	**	**	***	**	***	*

ship II.						
II.						
Confrontation	***	-	***	***	**	*
Changing Wind	*	***	*	*	***	**
Active plural.	*	***	***	**	***	*
Passive plural.	**	**	*	*	**	*

Significant parts of tasks where experts' involvements should be required are allocation decisions with long term impacts. Reaching decisions about the style of societal changes means judging the distant future and that cannot proceed from analytical models alone. Decisions about development strategies involve a complex of relevant factors and in those situations it is hard for anyone to make objective judgements without being influenced by the actual reactions to success and failure by the recent political elite. Major policy failures of the 90ies were usually supported by some superficially-plausible popular theories mostly imported by foreign aid or developmental advisors as authoritative figures. In that sense something similar to the new-era theories of the speculative bubble scandals were observed by us [SHILLER,2001,7]. The judgement error here is not naivité but arises instead from difficulties assessing the source of the public prominence of transferable policy-offers. Most social scientists involved into policy-support or preparation here were in the 90ies unexperienced concerning the political environment. Acting without the accumulated routines regularly used in those situations in principle they have two options. To act according to the rules of academic behaviour- individualistic, asking for more preparatory work, or repeating the statement-opposition duality of the university-based debates. Or to try to conform to the consensus of the group in order to preserve their status in the eyes of the politicians. JANIS refers to that as "effectiveness trap" [JANIS,1982,115-119].

The recent empirical literature here suggests that academic experts have been able to do a little better than the commercial [market-based] experts. The direct existential interest in the success pushed the second group towards more vulnerable shortcuts by acceptance of actual situative factors

in suggested policies. In that sense there is a persistence of performance among experts. One reason that experts may not do better is that they feel that they are dealing with clients who have expectations of them that make it difficult to pursue their own best judgement [SHILLER,2001,13]. The politicians expect them to offer solutions in accordance with certain fads. These effects dilute the advantages that academic experts naturally have. The need for justifiable authority to change policies that have been successful in the past imposes a sort conservative compliance with broadly perceived traditional wisdom a past decisions. Committees apparently have great difficulties taking action to alter their their former conclusions on the changing weight of evidence.[SHILLER,2001,15]. In most cases a striking argument that is trenchant and on target is absent [the "scientific" evidences represent different visions from different disciplines and research traditions] and the academic expert tends to make only perfunctory objections.

Preliminary conclusions. Debates about "weak states" and their impacts on post-socialist developments significantly influenced the intellectual landscape of the early 90ies. Traditional analytical work in this respect underlines the importance of neoliberal elites and their experts from the local academic world and from outside. But a more detailed investigation shows that on one side post-socialist neoliberalism was not an ideology mobilizing local elites to proper actions. What happened that was just the opposite; it was used as a sort of discourse covering primary individual interests of the elite in demobilization or marginalization of state bureaucrats still in charge of some control functions [e.g. pseudo-owners] in the state-economy. But the whole debate was relativized by the neo-etatist reconstruction programmes of the late 90ies proposing a new coercion model.

The neoetatist programmes re-tailored the dominant markets of social science expertise. After the collapse of major policy institutions inherited from the 1989 period the market was controlled mainly by individual experts [party-bounded and/or academic] and NGOs feeded by international grants and projects. The new "strong state", or even the ambitions to stabilize it created a new wave of institution-building in the expert knowledge production.

The social history of political expertise in post-socialism could be interpreted as development of ideas, individuals roles and organisations. In this paper the attention was focused on the institutional perspective. Mapping the agencies, their networks and style in the knowledge production we can better understand the evolution of post-socialist ideology-based policies, too.

Changes in expert strategies are usually influenced by the dynamics of expert-client interactions inside of the political class. Dependency and/or autonomy of experts is not only content, but situation-bounded.

Dimensions of expertise management are not independent variables, but framed and packaged by the expert agency strategies. Combination of different role sets in expertise [political R+D, knowledge diffusion, legitimation] is function of expert strategies and organizational forms in knowledge production agencies and only via them influenced by the preferences of the political elite.

ANNEX- TABLES

TABLE No.1

European Innovation Scoreboard 2002 – Candidate Countries¹

No ²	Indicator	EU	BG	CY	CZ	EE	HU	LT	LV	MT	PL	RO
1.1	New S&E grads	10.26	4.73	--	4.00	6.83	4.49	9.35	5.52	6.12	5.90	--
1.2	Population with 3 rd education	21.22	21.29	26.76	11.59	29.42	13.96	45.03	18.15	7.00	11.73	9.9
1.3	Life-long learning	8.5	--	3.1	--	5.3	3.0	3.7	16.3	9.7	5.2	1.1
1.4	Empl med/hi-tech manufacturing	7.57	5.50	1.03	9.16	4.79	8.80	3.18	1.72	7.14	7.54	4.9
1.5	Empl hi-tech services	3.61	2.71	1.83	3.22	3.38	3.24	2.01	2.19	3.06	--	1.4
2.1	Public R&D/GDP	0.67	0.41	0.20	0.54	0.53	0.45	0.53	0.29	--	0.45	0.10
2.2	Business R&D/GDP	1.28	0.11	0.05	0.81	0.15	0.36	0.07	0.20	--	0.25	0.30
2.3.1	EPO hi-tech patents/pop	27.8	--	--	--	--	1.51	--	--	--	--	--
2.3.1A	EPO patents/pop	152.7	3.2	6.0	12.1	6.9	16.1	1.1	2.5	--	2.3	0.9
2.3.2	USPTO hi-tech patents/pop	12.4	0.12	--	0.58	--	0.30	0.54	--	2.60	0.05	0.04
3.1	SMEs innov in-house	44.0	--	--	--	33.2	--	51.0	--	15.4	4.1	--
3.2	SMEs innov co-op	11.2	--	--	--	13.0	--	12.0	--	4.9	--	--
3.3	Innov exp	3.7	--	--	--	2.4	--	--	--	--	4.1	--
4.1	Hi-tech venture capital/GDP	0-242	--	--	0.021	--	0.035	0.900	0.624	--	0.045	--
4.2	New capital	1.73	--	--	--	--	--	--	--	3.68	0.23	--
4.3	New-to-market prod	6.5	--	--	--	6.0	--	--	--	37.8	--	--
4.4	Home Internet access/household	37.7	--	--	--	9.8	2.6	3.0	2.0	--	8.0	--
4.4A	Home Internet access/pop	31.4	7.5	22.1	13.6	30.1	14.8	6.8	7.2	25.4	9.8	4.5
4.5	ICT expenditures/GDP	8.0 ³	3.8	--	9.5	9.6	8.9	5.9	7.9	4.1	5.9	2.2
4.6	Manuf hi-tech value-added share	10.1	5.90	--	--	--	14.85	22.35	--	22.44	--	--
4.6A	Inward FDI/GDP	30.3	26.4	23.7	42.6	53.2	43.4	20.6	29.1	84.7	21.3	17.7

- 1: Data in italics are national estimates collected from the Group of Senior Officials in Innovation Policy.
 2: Indicators 2.3.1A, 4.4A and 4.6A are alternative indicators.
 3: The EU mean is calculated using WITSA/IDC data and is thus not comparable with the mean for the MS Scoreboard as shown in Annex Table B.

TABLE NO.2.

Candidate Countries: spread in performance (EU=100)

No.	Indicator	EU Mean	CC Mean	CC leaders		
1.1	S&E graduates / 20-29 years	10.3	6.6	13.1 (SI)	9.4 (LT)	6.8 (EE)
1.2	Population with tertiary education	21.2	17.5	45.0 (LT)	29.4 (EE)	26.8 (CT)
1.3	Participation in lifelong learning	8.5	5.4	16.3 (LV)	9.7 (MT)	5.3 (EE)
1.4	Employment in med/high-tech manufacturing	7.6	5.4	9.2 (CZ)	8.8 (HU)	8.7 (SI)
1.5	Employment in high-tech services	3.6	2.6	3.4 (EE)	3.2 (HU)	3.2 (CZ)
2.1	Public R&D / GDP	0.67	0.41	0.68 (SI)	0.54 (CZ)	0.53 (EE/LT/TR)
2.2	Business R&D /GDP	1.28	0.32	0.83 (SI)	0.81 (CZ)	0.45 (SK)
2.3.1A	All EPO patents / population	152.7	7.1	20.6 (SI)	16.1 (HU)	12,1 (CZ)
2.3.2.	High-tech USPTO patents / population	12.4	0.5	2.6 (MT)	0.6 (CZ)	0,5 (LT)
4.1	Hig-tech venture capital /GDP	0.24	0.27	0.90 (LT)	0.62 (LV)	0,15 (SI)
4.4A	Home internet access / 100 population	31.4	14.8	30.1 (EE)	30.0 (SI)	25,4 (MT)
4.5	ICT expenditure /GDP	8.0	6.0	9.6 (EE)	9.5 (CZ)	8,9 (HU)
4.6A	Inward FDI /GDP	30.3	31.3	84.7 (MT)	53.2 (EE)	43,4 (HU)

TABLE NO.3.

Propensity to invest among new enterprises

%

Percentage of active enterprises making investment (of those created previous year)					
	1996	1997	1998	1999	Average
CZR	37.8	38.6	36.6	34.6	36.9
EST	32.0	46.1	40.1	45.2	40.9
HUN	44.5	50.6	48.7	43.9	46.9
POL	35.9	33.5	31.6	27.3	32.1
SLO	42.9	41.1	44.8	36.4	41.3

TABLE No.4.

Productivity indices of R&D systems in selected groups' countries

	Patents/ GERD	S&T journals /GERD 1998 or nearest year	Patent applications /R&D personnel FTE	S&T journal articles / R&D personnel

				FTE
Candidate countries*	1.60	4.62	0.03	0.07
Cohesion countries	0.48	2.33	0.04	0.09
High Income	1.14	1.36	0.11	0.12

*without Cyprus

TABLE No.5.

**Relative orientation of R&D systems of CE candidate countries
(cohesion or high income =1)**

	Patents/ GERD	Paper/ GERD	Patents/ Personnel	Paper/ Personnel
Cohesion EU	3.33	1.98	0.80	0.69
High Income EU	1.40	3.39	0.27	0.56

TABLE No.6.

‘Productivity’ and orientation of R&D systems

	Resident Patents/GERD, 1998 or nearest year	Resident Patents/ R&D personnel 1998 or nearest year	S&T journal articles/GERD 1998 or nearest year	S&T journal articles/R&D personnel 1998 or nearest year
Candidate countries				
Cyprus	0.00	0.00	-	-
Czech Rep	1.02	0.03	3.21	0.09
Estonia	0.76	0.00	7.66	0.05
Hungary	2.64	0.04	6.02	0.08
Poland	2.36	0.03	3.93	0.05
Slovenia	1.25	0.04	2.27	0.06
Cohesion countries				
Greece	0.13	0.00	3.92	0.11
Ireland	0.98	0.10	1.15	0.09
Portugal	0.16	0.01	1.86	0.06
Spain	0.66	0.03	2.39	0.12
High income Countries				
Danmark	0.97	0.08	1.32	0.12
Germany	1.54	0.15	0.82	0.08
Netherlands	0.77	0.07	1.62	0.13
UK	1.30	0.11	1.69	0.14

Source: Calculated based on WB CDROM World Development Indicators 2001, OECD MSTI 2000, Slovenian Statistical Office data, and for Estonia on HERNSENIEMI (2000) Table 6 – ‘Productivity’ and orientation of R&D systems

TABLE No.7.

Impact of R&D – Importance of innovative and absorptive capacity

(Sample of domestic firms in technology intensive sectors)

	BG	CZ	EST	HU	PL	RO	SK	SLO
Constant	***0.089 (3.011)	0.053 (1.364)	0.119 (0.061)	0.100 (0.844)	***-0.202 (-4.128)	** -0.033 (-1.964)	-0.164 (-0.873)	***-0.738 (-4.255)
Capital	***0.072 (3.522)	***0.689 (18.752)	***0.047 (2.741)	0.140 (1.330)	***0.322 (5.764)	***0.089 (4.935)	**0.913 (2.104)	0.012 (0.778)
Labor	***0.199 (4.286)	***0.199 (3.845)	***0.413 (.3.333)	-0.001 (-0.998)	0.084 (1.475)	***0.182 (9.589)	***1.080 (3.935)	***0.374 (14.269)
Inter-mediate	***0.698 (38.714)		***0.271 (5.787)	***0.819 (7.403)	***0.003 (9.693)	***0.710 (56.917)		***0.311 (22.430)
R&D	0.000 (0.106)	**0.008 (2.369)	*0.269 (1.934)	-0.001 (-0.118)	-0.002 (-0.451)	***0.012 (3.715)	***-0.004 (-9.904)	-0.001 (-0.977)
Spillovers	0.001 (1.637)	0.0001 (0.191)	0.002 (0.075)	-0.001 (-0.612)	-0.0004 (-0.498)	0.0003 (0.549)	0.010 (0.146)	-0.002 (-0.488)
Spillovers*R&D	***-0.009 (-6.233)	0.000 (-0.309)	-0.004 (-1.597)	-0.002 (-1.384)	***-0.001 (-2.565)	***-0.001 (-3.116)	-0.006 (-0.112)	0.0001 (0.815)
Adj. R ²	0.903	0.339	0.372	0.915	0.422	0.820	0.570	0.533

TABLE No.8.

FOREIGN PATENT APPLICATIONS IN US

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Sweden	0.94	0.82	0.84	0.90	1.03	1.10	1.09	1.52	1.74	1.96	2.18
Finland	0.67	0.74	0.60	0.66	0.75	0.88	0.91	1.22	1.35	1.26	1.49
Germany	0.97	0.93	0.88	0.85	0.84	0.87	0.89	1.17	1.21	1.32	1.45
Czech*	0.97	0.02	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.05	0.03
Slovakia	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00
Hungary	0.00	0.09	0.06	0.05	0.05	0.04	0.03	0.05	0.04	0.04	0.06
Poland	0.09	0.00	0.00	.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Slovenia	0.00	0.00	0.02	0.06	0.03	0.07	0.04	0.10	0.07	0.09	0.11
Estonia	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.03	0.01
Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Lithuania	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Romania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bulgaria	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Russia**	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.02

*Czech patents are counted as the sum of Czech and Czechoslovakian patents.

**Russian patents are counted as the sum of Russian and Soviet patents.

Source: US Patent Office.

TABLE NO.9.
EMIGRANTS FROM THE RUSSIAN R+D SECTOR [1000']

1980	1989	1990	1991	1992	1993	1994
0.14	0.95	2.1	1.8	2.1	2.3	2.1

Source: Russian State Committee on Science, Moscow, 1995

TABLE NO.10.
NEW SCIENTIFIC DEGREES GRANTED IN RUSSIA [1000']

	TOGETHER	DOCTORS OF SCI	CANDIDATES
1989	33734	4193	29541
1990	35117	5067	30050
1991	35040	6326	28714
1992	29612	5491	24121
1993	19176	3497	15679
1994	16217	3253	12964

Source: Russian State Committee on Science, Moscow, 1995

TABLE No.11.
GRADUATE SCHOOLS IN THE RUSSIAN HIGHER EDUCATION

	„aspirants”			New graduate enrollment			Graduate output		
	1992	1993	1994	1992	1993	1994	1992	1993	1994
Together	51915	50296	53541	13865	16507	19416	14857	13432	12292
Physics- matematics	5168	5096	5399	1536	1805	2006	1610	1323	1234
Chemistry	1825	1774	1800	530	579	643	518	450	432
Biology	2655	2628	2714	683	849	955	740	688	674
Earth sciences	1223	1067	1014	285	297	322	364	315	256
Engineering sciences	16585	14679	14851	3857	4546	5483	5234	4570	3683
Agriculture	1850	1696	1780	430	521	632	566	501	436
History	2242	2185	2308	613	667	780	543	565	529
Economics-business	5310	4948	5521	1283	1625	2072	1473	1329	1162
Philosophy	1385	1444	1564	386	475	531	361	339	360
Literature- philology	2572	2777	2983	775	898	982	590	574	618
Geography	700	716	806	198	234	302	175	166	160
Legal sciences	1029	1169	1418	357	451	544	216	244	218
Education	2519	2904	3271	778	1038	1207	625	553	624
Medicine	3739	3670	3816	1101	1180	1347	1116	1041	1079
Pharmacology	154	150	155	52	45	58	48	38	38
Veteriarian sciences	400	395	451	122	147	159	124	101	90
Art history	731	905	1201	281	387	516	187	203	268
Architecture	238	244	248	61	74	73	47	54	56
Psychology	698	84	1100	251	330	378	123	150	161
Sociology- social research	652	740	818	205	262	291	152	139	150
Political sciences	235	261	317	79	97	132	45	83	59
Others	5	8	6	2	-	3	-	6	5

Source: Russian State Committee on Science, Moscow, 1995

TABLE No. 12.
STUDENT DYNAMICS IN THE RUSSIAN HIGHER EDUCATION [at the beginning of the schoolyear]

	Number of students	New enrollment	Output
1985	2966	634.6	476.6
1986	2907	633.3	468.6
1987	2835	626.9	439.4
1988	2795	621.0	438.1
1989	2861	602.7	432.8
1990	2824	583.9	401.1
1991	2763	565.9	406.8
1992	2638	520.7	425.3
1993	2543	543.5	443.6
1994	2534	567.7	406.5

Table No.13.

INSTITUTIONAL STRUCTURE OF RUSSIAN HIGHER EDUCATION [students in 1000*]

	COLLAGES		STUDENTS		NEW ENROLLMENT		OUTPUT OF THE SYSTEM	
	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95	1993/94	1994/95
Together	626	710	2612.8	2644.6	590.7	626.5	445.0	409.9
State universities	548	553	2542.9	2534.0	543.5	567.7	443.6	406.5
Private universities	78	157	69.9	110.6	47.2	58.8	1.4	3.4

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