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Transformation of National Research System in the Countries of Central Eastern Europe

The aim of the paper is to assess the ongoing changes of the research institutions in the countries of Central Eastern Europe (CEE). It goes without saying that the research institutions, their functional features, autonomy and authority cannot be considered without reference to the changes in their economic, political and socio-cultural environment. As generally perceived, such changes in these countries have qualitative and abrupt features, usually defined as transition or transformation. With respect to the undergoing discussion on the nature of these ways of transformation two basic issues are worth analyzing: (1) how one understands institutions and institutional change in general and in the field of research activity in particular, taking into account the current discussion in the social sciences on that issue, and (2) how one specifies the common features of social changes.

Institutions are here understood as social systems marked by the prevailing function which has become differentiated (and a source of autonomous action) since it has been socially promoted and has been found

to have cultural acceptance and general meaning. For that reason a study of institutions should not be focused on their (internal) functions and aims only but on the ways these are resisted, negotiated and valued by their (external) users, or challenged by alternative functions and actors. Such an ecological approach aims at studying the institutions by help of the borderlines shaped by confrontation and balancing the external and internal (power) factors while the selective role is attributed to cultural, evaluative framework (Zapf & Dierkes, 1994). Any social change, or increase in social status can gain a reliable form provided it is preceded by extensive legitimization efforts and trustfulness¹. A similar turn is setting in in the study of research institutions – it is found out that their “steady state” is accompanied by turbulent changes in their external environment and S&T public assessment, in the internal social setting, organization and communication patterns and in the shift of the valuation patterns of scientific communities (Cozzens, Healey, Rip & Ziman, 1990).

The borderline approach seems to be promising in the study of the transitory situation of the CEE countries provided it is sensitive enough to follow the structural as well as action oriented aspects. The radical developments in these countries are challenged both by the structural changes and constrained by the structural dependencies, and the power of the winners (and their networks) of the political democratization who have become important actors of the transformation process².

The common feature of the institutional change of the CEE countries is a transition from an autocratic and centralistic regulatory system to a competitive and pluralistic one, which found overwhelming political support at the beginning of the 1990s. Such political will and its public support was probably a ground for the peaceful, non-violent political turn (and absence of countervailing – counter-revolutionary – power) and the mobilization of moral reasons and the utopian visions of “civic society” to legitimize the new political elites (Deppe, Dubiel & Roedel, 1991). However, the political scene and the public issues started to differentiate as the economic and regulatory issues came to forefront. This orientation mobilized the other “dissenting force” of the former centralistic regime – all forms of “black economy” and “second society” which arose since the 1970s alongside the declining centralistic power. The dual pattern of society, sharpening the difference of formal and informal social events, was present and developed in all countries and shaped the social forces into democratic change but with differing social rooting and orientation. The political leadership of the new democracies is facing the problem of how to reshape the framework (repressive, legal and moral) of such informally oriented actions to the conditions of the democratic power formation; the competing visions of “re-foundation” of a civic society, or the standard market economy are reflecting, in fact, the route of mobilization of the diarchic western cultural resources of freedom and solidarity.

The CEE countries are noted by rather

common structural dependencies – such as the technology base of industries, regulatory patterns and social structuration. Yet the resources of political mobilization, as they become apparent from the re-formative strategies, are different. Such different ways of political mobilization can be observed in the institutional changes – the way of disembedding of the centralistic regulatory patterns and the formation of the standard market institutions: the privatization process, the formation of labour and capital market as well as the growth of an efficient banking system (EBRD, 1994).

The crucial structural dependence, and the aims of the transformation are resting with the *de-etatization* – formation a borderline between the economic and political systems, between the new political actors and the executive bureaucracy. The transformation process is overloaded with a challenge to transform simultaneously the economic and political institutions as the reformative efforts in both spheres usually contradict each other. The economic transformation may undermine the political expectations and support (of individuation and free association and movement) from two sides: either its stagnation invokes unpredictable social turbulence (and a space for populist and nationalistic political movements), or its radical recovery (and privatization of property) is reviving the established corporative and monopoly-like regulatory structures which are difficult to be subjected to dynamic, open competition and democratic control.

When the structural economic dependencies (such as technology networking of heavy industries, economic differences among the manufacturing branches, concentration of the industries, etc.) are not addressed, the essential institutional issue of transformation – a division of economic and political power may be curtailed, and thus implicitly the borderline between the public and private spheres. In fact, such change is of a cultural nature, depending not only on a political context and skill of politics but on the revival of the

legitimation capacities, the forms of cultural rationalization. They have direct impact on the institutional transformation as they offer a reliable re-embedding of social action by its cultural rooting. Severe problems of legal and environmental awareness, business ethics, public justification and orientation, problem-oriented public discourse and communication are giving evidence of such emerging cultural adaptations and different resources mobilized by individual CEE countries.

The research institutions are essentially influenced by the environment of economic and political transformation. They have generally utilized the political liberalization to re-found their research autonomy with a reference to their academic and technological mission. The following stage of *de-etatization* and economic transformation is, however, challenging them with more profound changes. My inquiry discusses the reinstitutionalization of the research field, or national research system, in the CEE countries attempting to describe their present stance in the pull of structural socio-economic and scientific dependencies and the push of transformative strategies of the single countries. Of course, such an approach is hard to follow without empirical backing – sometimes embracing the tacit socio-political context of political process. In this sense I will refer, mostly implicitly, to my research experience and the results of research teams and projects having studied and assessed the situation of the CEE countries from a regional and East-West comparative perspective³.

Conceptual framework

From the viewpoint of the socio-cultural framework the development of the research institutions in the CEE countries can be assessed within the European tradition following the academic (educational) and industrial (technological) aims within specific power structures influenced by the

integrating/regulatory role of the state. In principle the features of both the decentralized (German) and the centralized (French) pattern have been influential in the formation of the national research institutions after the World War I. However, the position of the state in relation to the citizens and human rights was different from that of the West European countries. In particular, it was short of the evolution which shaped the state as a form of social contract producing its public respect, as well as its respect to the autonomous political public exerting control over its power.

Firstly, in the CEE countries, the state was implemented as an instrument of belated nation-based liberation mobilizing primarily the forms of cultural rationalizations (national language, education, humanities, science etc.) and hence promoting the role of the intellectuals. Secondly, its function was laden with practices inherited from the Austrian monarchy, i.e. by repressive features and the high status of bureaucracy. For that reason the borderline between the state and the functional institutions, including the research ones, has always been penetrated by the state regulatory interests and diluted by a brittle identity and autonomy of professional communities, including the scientific one. This situation promoted several kinds of social conflicts, such as the tension between the cultural and business elites, and tensions between the state competencies and citizen's rights, including all kinds of self-organizing activities.

The above-mentioned tensions and conflicts can be observed in the formation of national research institutions (systems), in particular in the relationships (and borderlines) between academic and industrial science, between the discourses of natural science and of the humanities, between research (its social system, ethos and autonomy) and the public role and reputation of science. The interpenetration of the scientific and political institutions enables an easy diffusion of academic or technology actors to power positions, of technocratic or humanistic perspectives into

political ideologies, and of the features of critical discourse into public negotiation, but also the formation of traditional resistances to S&T institutions with destructive implications for their integrity and identity.

The socialist reformation of the research institutions continued in this structural course and institutionalized, in fact, the conflicting poles of the research system: academic versus industrial science; state regulation versus research autonomy. There was a universal framework of the institutional reformation of national research systems: science was proclaimed as a growth factor (productive force) and the research institutions' areas became subject to state regulatory practices. Even if there was no open "Bernal – Polanyi discussion", as we know it from the Western European developments, a similar dispute accompanied the *etatization* of research institutions; the part of the research community siding with Bernal's ideas became the internal actor of this institutional reformation. The academic communities could, therefore, negotiate the formation of the Academies – an institution the autonomy of which was based on an advisory role to sovereign (monopolized) political power and hence a respect to it. Alongside this compromise, a change in the cognitive role of academic bodies was achieved: academic research was separated from teaching and transformed into so-called basic research activity.

In a similar way, industrial science was promoted and reformed. Technology was understood as an applied science facilitating the productive potential of industrial branches. That is why the in-house industrial laboratories, or groups of industrial scientists and researchers, were concentrated into branch-oriented research institutes, which were funded and oriented from the executive level – by the Ministry of Technology in order to promote technology growth and transfer within the whole group of manufacturing industries. The status of technology actors was changing – their former networking with industrial and academic communities was

replaced by the "situs" within the executive hierarchies; their former preoccupation with the production programmes and product developments of the enterprises retreated to inquiry into technological process and their systematic control.

The above-mentioned socialist institutionalization of research had some common features with the push-oriented and dual model of the 1950s and early 1960s (mobilization of the research community by extensive funding, promotion of technology transfer) as it was also experienced in the Western countries. Yet, its further development diverged from the general trends of post-industrial developments, which were influenced by market institutions and public control, which produced a chain of institutional adaptations and socio-cultural shifts in the technological infrastructures – including the research institutions.

Of course, the developments in the socialist system were not so closed, and immune to the changing technological patterns as some representations are indicating. The technology push cannot be controlled completely by an alliance of political and research establishments. It contains a cultural impact and individuation drive which has to be coordinated by cultural, self-organizing patterns. If not, it undermines the monopolistic regulatory forms regardless of their systematic features. However, they do not affect the political regime only, but split the social infrastructure and produce a state of social anomy. Such implications could be observed in various forms of "second society" or "shadow economy"; their potential (power) was growing in a spontaneous way anywhere where the central power was losing its influence. Their local power could not be assessed at the background of reliable (public) evaluative and communicative patterns, such as the price produced by market institutions, the political orientation produced by a pluralistic political system, and the cultural identity produced by the modern forms of cultural rationalization. In fact, all the forms of cultural change have been lagging behind in coping

with, and countervailing, the technological advances.

The former socialist countries have fallen into "a blind alley" of technocratic modernization which has brought about the imbalance between the growth of technology and the patterns of its economic and public control. It is observable not only in the specific distribution of S&T capacities but also in the institutional patterns being short of effective borderlines between the regulatory power, and its entrenchment with the techno-industrial patterns, on one hand, and the political public mobilizing democratic control of regulatory power and the cultural change, on the other. This institutional gap is a source of power of structural dependencies with their industrial technologies and functional regulatory practices and the constraints which are facing the reformative efforts. Let us examine the impact of this environment upon the transformation of national research systems in the CEE countries.

Changing situation of the research institutions in the CEE countries

The situation of the research institutions in the CEE countries is generally perceived through the radical cuts in R & D funding, extensive drain of research manpower from research institutions to the private sector and the various forms of survival strategies applied by the research institutions responding to the changing environment. Such indications signal changes in their national research systems. However, they do not give full account of the recovery of an interface of research capacities with their socio-economic environment, which would promote the research potential, the sources of its growth and orientation. The conceptualization presented above outlined the pattern of basic structural problems which may help to assess the underlying changes of the research institutions from this perspective.

The situation of the research institutions

reflects the general and spontaneous advance of the social events bound to the collapse of the autocratic political system: firstly, the political liberalization and the *de-etatization* were utilized by the research communities⁴ to refound their autonomy in legal terms. In all countries the relevant laws were enacted confirming the traditional self-regulatory patterns and freedoms of research establishments. However, the new legal framework took over the existing pattern of the research institutions – their five sector structure (Higher Education, Academies, Government, in-house industrial research, branch-oriented industrial research) – even if the foreign expertise (e.g. the OECD studies on the S&T system in Czechoslovakia and Hungary) suggested to start with a re-approachment to a standard three sector distribution (business enterprise sector, higher education sector and governmental sector) and search for a possibility to revive the private non-profit one. So, the extensive sectoral distribution was entrenched in social terms – by the autonomous collegial bodies of these institutions. The legalized social position of the research communities has become either a source of powerful resistance to top-down institutional changes, e.g. of merging the research sector of academies of science with the university sphere, or a bottom-up political influence, e.g. in the re-establishment of the executive organs for the promotion of S&T activities. In all countries, the former pattern of distribution of academic science by the research capacities of academies of science and universities was re-confirmed. In all of them, except the Czech and Slovak Republics, the ministerial bodies for technology issues were also re-constituted with slight changes in the competencies.

The first achievements of the political liberalization have been, however, soon complicated by the changes in the political arena and the pressing economic and social issues. The first phase of rather differentiated spectrum of political actors was soon replaced by the patterns of more concentrated and consolidated political

forces whose selective and decisive power was bound to pressing public issues. At the same time the economic reforms were approaching crucial points of restructuring – both in forms of ownership and technological capacities – producing social tensions and conflicts. Due to the lack of political power (the credibility of the emerging competitive political system), and the unstructured pull of social claims, the crucial power instrument⁵ for their solution has turned out to be the state budget. Its balance and distributionary competence have become crucial public power instruments. Due to the advance of the economic reform, and the financial troubles of the industries, the research institutions have become critically dependent on the resources of the state budget and the re-distributive pattern of fiscal policy. Their perspective has been narrowed by the bottleneck of sources of funding, and of the specific transitory problems of the fiscal policy.

So, in the real power terms the issues of science and technology, and the problems of research institutions, have been pushed back by the pressure of extensive and urgent social demands. They have fallen into a field of “social consumption” and into the lower scale of its items – without any chance to be assessed by their productive role. The issue of sources of R&D funding, and its distribution by public and private aims, seem to be an important structural issue of the situation of research institutions, their growth options and orientation. Let us focus our attention on the analytical side of this problem.

Regulatory issues of the changes in the national R & D systems

In the former (centralistic) regulatory system the structure of R&D funding was mostly marked by a balanced role of the state and enterprise sources, even if the size of the enterprise R&D funds was not a result of independent decision of enterprise management but a rule given by government. As explained in the introduction,

such indirect state subsidy to the industrial R&D was growing with the reformation and de-centralization efforts in the 70s and 80s. It promoted a growth of technological demand of manufacturing industries. Many research institutes were able to actively use this situation and the plurality of sources of funding to raise their autonomy, research competence and growth.

During the transformation period the industries, regardless of their decentralization and privatization, have fallen into a deep financial crisis. As such they cannot afford to accumulate funds for investments and industrial research. The R & D funds of the (business) enterprise sector are heavily reduced (see Table 1), although the challenges of the technological reconstruction of industries are extensive⁶. Similar financial constrains have affected the sources of public R&D funding. However, the public funding from the state budget has retained its leading role. Consequently, the decline of industrial research, as Table 1 indicates, has been deeper than the overall decrease of R&D capacities (except in Poland). It is also due to weak public schemes for technology promotion and orientation. Table 1 also describes differences among the countries involved, which apparently reflect the different transformation strategies: the radical approach of the former GDR and Czech Republic, on one hand and a more evolutionary approach by Poland and Hungary, on the other.

Table 1: Dynamics in R&D reductions in the selected CEE countries (reference year: 1989=100%; total R&D manpower)

country	1992 (%), total R&D manpower	1992 (%), industrial R&D manpower
Hungary	64,4	51,6
Poland	71,0	72,0
Czech Republic	48,1	43,8
Bulgaria	54,7	51,7
Croatia	79,0	19,0
GDR/NFC	37,5	25,0

Sources: National reports on the project of Academy-Industry Relationship in the CEE countries; Meske 1993; Radosevic 1993.

Essential changes can be observed in the organizational structures of manufacturing industries and strategies of the new (semi-privatized or privatized) industrial actors. After the liberalization of foreign trade, and growing competition on the domestic market, the management of enterprises has understood clearly that, in the long run, competitive advantage can be gained by technological competence, for which research efforts are needed. Yet, the capital is missing. The liberalization of foreign trade has, of course, brought about an increased inflow of foreign technology and extended the supply side of the national technological markets. The enterprises, in particular the private ones, can meet their technological demands by help of joint ventures and capital and technology transfer. As far as the domestic expertise or R&D supply are concerned the private companies prefer to use a cheaper supply which has been formed by various private R&D actors (individuals or small teams) who have spinned off from the research institutes. The imbalance of the national technological market is analyzed by Kwiatkowski (1992). He explains the reasons of the imbalance between the demand and supply side of the technological market with reference to the form of the privatization "movement" in the Polish research system. His conclusions have general validity for the transformative countries – the social system of research is based on individual effort and responsibility, and if institutional failure occurs and there is available space for entrepreneurship, the mobility of R&D personnel to the private sector is understandable.

However, in the situation of the available comparative advantage some larger firms, as the Czech experience is indicating, can respond to the new market challenges by capital saving strategies of technological improvements in their production patterns (accompanied by an advantage of easier approach to domestic market). In case the of the Czech situation such comparative advantage was formed by the fixation of the exchange rate at the level exceeding twice the

purchase power of the domestic currency. Such intervention has helped to re-orient more than half of the export from the collapsed eastern markets to the EC territories.

From the side of the emerging private sector the R&D capacities and technological expertise are shaped by the following criteria and limitations:

- 1) low costs or *ad hoc* nature of expertise
- 2) openness to international technological and capital market
- 3) technological flexibility within the appropriated production programs.

In general terms it can be said that the ongoing privatization is disembedding (Giddens, 1990) the relationship and networks of the enterprises with the domestic research capacities in order to re-embed them into a context of international capital and technology market and more effective production forms.

The power and impact of the public side of R&D funding has been already briefly outlined. Even if among the CEE countries there are differences in the way in which the issues of research are represented in the decision-making about the state budget outlays, they are facing similar constrains, stemming from structural dependencies and tensions. They are called up by several contradictory pressures. On the one hand, the size of the state budget in relation to the GDP is in all countries still very high and should be decreased because of both the growing role of the private sphere in the re-distribution of the national product and also the need to limit the power of the state bureaucracy. On the other hand, the role of the state budget is related to the extensive welfare functions of the state which can't be transferred easily to the sphere of private responsibilities. Also, most of the productive units (big enterprises and public facilities) are still dependent, directly or indirectly, on the re-distributive role of the state budget and have a power to maintain such dependence by the pressure of their vested interests. Such pressures, without being mediated by a competitive market situation and an

efficient (participative and selective) political process, do not allow the systematic role of the executive power to grow. On the contrary, it is entrenched in the differentiated power arena, in which techno-economic patterns usually play the crucial role.

Such phenomena can also be observed in the re-formation of the S&T policy of the governments in the CEE countries. As the democratic political changes have mobilized the bottom-up activities, they could to a lesser or larger extent recover the position of S&T communities in the executive branch. They could, however, reach the traditional status of research policy: a certain amount of public outlays to be granted to R & D and the autonomous competence of research communities in their distribution. There is still no countervailing problem-oriented public process which could mobilize the awareness of technological capacities in relation to the perceived public issues, and the executive and parliamentary activities in this perspective. As far as the public R&D promotion is concerned the following general trends may be identified:

- 1) limited amount of resources vis-à-vis the pressing social claims;
- 2) limited coordination capacities in the executive branch to stimulate the technology diffusion
- 3) limited political capacities to resist the technology based vested interests which mostly represent the networking of industrial actors with the executive bureaucracy.

In general terms it can be said that the ongoing *de-etatization* has re-organized the regulatory system of S&T, but has not changed the regulatory practices and their efficiency in the public promotion and utilization of S&T resources.

Outline of the changing institutional setting of the national R&D systems

The formation of an effective borderline between the public and private sector is of

crucial importance for the transformation of the national research systems in the CEE countries. Anyhow, it will be a long-term process depending, after all, on the socio-cultural changes. So far, some contradictory tendencies can be observed which do not seem promising for the shaping of reliable interactions between both spheres. The emerging private sector is forming the signals of market pull, but exploiting the available domestic or foreign technology resources. The public actors have narrowed their roles to a minimal support of the existing research institutions. Evidently, together with the innovation-oriented and S&T based actors (social system of science (Krohn & Koppers, 1989)) intermediary schemes and types of activities are missing which would promote and orient public research activities in the line of their utilization, and the private sector in the line of responsibilities for growth and orientation of research institutions and infrastructure. The generally perceived problems with the formation of the private non-profit sector (as in Hungary and CR), which might represent such an intermediary zone, indicate that such a move is not the result of rational and consensual action but is dependent on the confrontation of differing social positions and perspectives.

The common structural problems of the transformation of the national research systems of the CEE countries have different expressions, depending both on their socio-cultural background and the political capacities to reflect and to solve the emerging issues. The differences can be observed in the level of basic indicators, even if their reliability and comparability is questionable so far. Let us focus our attention at analytical indicators of the national research systems.

The most apparent indicator of the national R & D system is its size expressed by GERD or research manpower indicators. The data on R&D manpower have been already mentioned. The indicator of GERD is more sensitive to monetary and fiscal fluctuations, yet in relation to national wealth, e.g. GDP, it gives evidence on the general trend of

decreasing R&D funding and the differences among the countries. This trend can be considered as the adaptation to an appropriate size of the national research systems. In comparison with the OECD patterns, the CEE countries, even if all of them are small or medium sized ones, maintained the GERD/GDP ratio at the level of 2,5 – 3%, which was representative for the group of large countries with ambitious space, energy and military R&D programs. Now, their GERD have fallen to a borderline between the low and medium sized group (see Table 2). At the background of this adaptive trend there are, however, different processes and strategies, which are more important from the perspective of the national research systems of the CEE countries. Some of them have been indicated above, in the case of the formation of the private sector and the transformation of the public sector. They can be observed also in the sectoral distribution of the national research systems.

Table 2: GERD/GDP ratio in the selected countries (1989–1995; in %)

	1989	1990	1991	1992	1993	1994
Hungary	1,98	1,69	1,18	1,13	–	–
Bulgaria	3,6	2,38	1,30	1,35	–	–
Croatia	1,02	0,43	0,87	–	–	–
Poland	–	–	0,97	0,92	0,86	1,35
Romania	2,61	1,84	1,66	1,69	–	–
Czech Rep.	3,2	2,6	2,1	1,87	–	1,4

Sources: the mimeographed papers prepared within the project AIR in the CEE countries (Simeonova: AIR in East Europe, Bulgarian Case; Lenardic: Innovation Potential Embodied in the Changing AIR; Balazs: Transition Crisis of Hungarian R&D Sector); The Basis for National S&T Policy, KBN, Warsaw, 1993; Sisesti I.: Restructuring Science in the Public Sector, George Washington Univ., Washington, 1994; Statistical Yearbooks of the CR, Prague.

The CEE countries are facing similar structural problems produced by the five sector distribution of their national research systems. Any radical projects to integrate academic science into the universities and industrial science into the enterprises have failed. There has been powerful resistance from the side of existing research institutions.

However, the deficits in funding and the privatization process are exerting powerful pressure on the existing institutional pattern. There are many common responses to such pressures – like the decentralization of the research institutions, a growth of their entrepreneurial activities, and the growth of competition among them. However, in the crucial aspects, their responses are quite different depending on the social status of the research establishment and the national regulatory framework.

As regards the distribution of R&D capacities by sectors there is evident difference between academic and industrial science: in the CR and former GDR the concentration of the research manpower is located in the in-house industrial research, while Hungary, Poland and Bulgaria are employing their QSE mostly in the sectors of Academies and Higher education. Of course, this need not say anything about the quality of academic and industrial science. Yet, there is influence on the disciplinary distribution and interdisciplinary interfaces, as a look at the bibliometric indicators indicate (Kozlowski, 1994).

The differences can also be observed in the course of re-institutionalization – in the patterns of political reflection of the R&D issues and the regulatory measures aimed at the solution of the perceived issues. Among others, the comparative analysis of the development of the industrial research

Table 3: Distribution of R&D capacities by research sectors in the selected CEE countries (1992, % of total R&D manpower)

country	HE	AcSc	Govern. sector	Industr. research	Industr. I research II
Hungary	51,0	16,3	7,8	7,0	17,9
Poland	17,5	6,2	47,1	→	29,2
Czech Rep.	8,6	13,3	22,6	18,4	37,1
Bulgaria	58,3	16,4	25,6	→	→
Croatia ¹	59,3		36,0	→	5,0
GDR/NFC ²	14,0		<-29,6	56,3	→

Notes: HE (Higher Education); AcSc (institutes of Academy of Sciences); Industrial research I (independent research institutes); Industrial research II (in-house laboratories); 1) 1991; 2) FTE (full time equivalent); <-> no distinct separation of statistical data from neighbour sector; sources: see Table 1.

in the Czech Republic, the former GDR and Hungary provides evidence about the different political strategies and sensitivity to the issues of industrial science (Schneider, 1994; Inzelt, 1994; Muller, 1995). In all these countries, the industrial research was dramatically influenced by the decline of production output and by the financial constraints of the manufacturing industries. In the New Federal Countries (former GDR) and the Czech Republic the decline of industrial research was radical, while in Hungary its size was decreasing moderately over an extended period.

The reflexive regulatory steps in these countries are quite different. In the Czech Republic most of the industrial research institutes became independent during the *de-etatization*, later the subject of coupon privatization, and now operate (except those which were closed) as public limited companies. Accordingly, no influential public support was developed in their favour. In the former GDR the limits of privatization of industrial research were observed and a specific form of transformation was developed, combining privatization with public support and evaluative expertise of the institutes. In Hungary the evolutionary change has been accompanied by efforts to combine the bottom-up and top down activities – the intermediary schemes are developed to promote the interfaces between academic and industrial science and protect the core research infrastructure against unfavourable external pressures – i. e. the network of Zoltan Bay institutes, the formation of Research Holding Company (Inzelt, 1994). However, the attempts to apply the evaluative expertise of industrial research institutes have not been successful.

Conclusion

This analysis on the situation of the national research systems in the CEE countries indicates that there are ongoing essential changes in their resources (inputs) accompanied by an increased mobility of research manpower and by the adaptive

steps of the existing research institutes aimed at survival in an environment of limited funding and increased competition. They are also marked by failures if the R&D actors are not in a position to cope with the new selective environment. The increased mobility of researchers is promoted primarily by the emerging private sector and the options to capitalize the research knowledge on the market. The market pull is an important framework for adaptive changes in the research institutes' activities. The current market pull is draining the national research systems in favour of the growth of the intellectual potential of the emerging business enterprise sector both in the manufacturing branches and in services. It is playing a powerful role in the re-distribution of domestic intellectual capacities. The present forms of economic mobilization are shaping many niches of innovative activity in terms of higher motivation of actors, better management and increased efficiency of new organizations. They are signalling a process of re-institutionalization of the national research system in terms of more efficient interfaces between its internal and external factors. However, the innovative pull of new institutional forms is, so far, not strong enough to disembed the existing institutions and mobilize their changes in the regulatory practices, communicative forms and functional orientation. The research institutes of the Academy of Sciences continue to legitimize their function by the aims of basic research; the universities see their main role in teaching; the industrial research capacities are still separated from the innovative efforts of the industries.

The reasons for resistances to institutional change are of a structural nature. The abrupt and comprehensive social mobilization is influenced by contradictory social trends. Their balancing is undermined by a weak regulatory framework, both in the political arena and market place, the authority of which is only emerging with the formation of the institutions of competitive market and polity. It seems to be hard to balance the spontaneous side of change with the rational

one, the fierce competition among unequal actors with the shaping of market institutions, and efficient public choice with a low public awareness and responsibility. On the other hand, the conflicting situation provides a chance to understand the potential for public learning and the shifts in valuation patterns which, after all, if well reflected by the political actors, give a reliable framework for regulatory steps, which are crucial point in the course of reformative strategies in the CEE countries.

NOTES

1. This formulation reflects the general supposition that any power claim should be legitimated; however, the present discussions on the nature of rationality and power are disclosing that such an issue is not trivial and depends on the pattern of power distribution (see Muench, 1991).
2. The general shift in the conceptualization of the changes in the CEE countries can be observed in the "construction" of a general descriptive notion; firstly, the traditional sociological term of "transition" was applied indicating even rather smooth changes; later the term of "transformation" (contrary to reformation) was applied indicating both the obstacles of structural shifts and distancing from visions of a "third way" (between the capitalism and socialism) (see Deppe, Dubiel & Roedel, 1991).
3. E.g. the project "Eastern and Central Europe 2000" (Gorzela, Jalowiecki, Kuklinski & Zienkovski 1994); OECD, 1992; the project on Academy-industry Relationship in selected CEE countries, coordinated by A. Webster and K. Balazs; the project "Technological Modernization and the Combinates" coordinated by CERNA, Paris.
4. The concept of the community is used here to indicate the self-organizing power of research actors. It does not include the notions of collegial authority for which there has been no realm of the research public. The researchers have been rather divided by their formal position and political adherence.
5. Among the sociologists the concept of power has been recently discussed in relation to understanding the issues of social change or development of modern/post-modern societies. Parsons' concept of power, developed on Sombart's understanding of the role of money, which is considered by some (post-modern) views as old-fashioned, seems to be relevant for the situation of the CEE countries: after the democratic institutions were deconstructed, and the public reputation of expert knowledge corrupted by a coalition with the regulatory power, the only medium of public power – an unescapable framework of a practical valuation – there remained was the monetary system. Those who have been able to

maintain its stability and credibility have been gaining public trust and authority.

6. It is rather risky to use data on R&D funding to describe the financial situation of the national research system. Such data have relevance only in the relational coupling, e.g. the GERD in relation to GDP, as the effects of inflation are eliminated. Due to rapidly changing production and consumption structure the application of deflator indexes is questionable. For this reason we prefer to use the manpower data to indicate the size of the research capacities.

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