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**Innovation Systems and Restructuring in the Central Europe and Russia<sup>1</sup>**

**Preface**

This book results from a research study on the problems concerned with the adjustments in Russian and Central Europe societies at the end of the century to growing importance of knowledge for economic performance, for industrial modernisation, and for international competitiveness.

The observers are neatly divided in their appraisals of the R&D on the eve of the economic liberalisation of countries of Central Europe (CE) and their place in the new market situation of 1990s. The extent of persistence of S&T outlays and the deepness of R&D depression observed between the two economic regimes are spheres of discussion. As scientific inventions and discoveries are normally of long run effects, they have been able to deaden the shock of transformation and favour the up today's restructuring. Growth theories have explained the persistence of countries' differences by particular self-reinforcing processes of investment in fixed capital, R&D and education, specific technologies and resource. Countries would consequently develop along certain trajectories, determined by past and present types of knowledge accumulation and use. Which kind of path-dependence is observable and which mutation co-dependent with restructuring may be forecasted? In transforming economic mechanism the intensity of past research activity appears to be in dissonance with the current aptitude to innovate. Some authors argue that Science and Technology (S&T) at the era of centrally planned economy were developing satisfactory, accumulating substantial potential for industrial innovation. Others are more sceptical, saying that S&T were in crisis as all other social and economic domains. All of them argue that currently Central and Eastern Europe countries and especially Russia are hit by innovation failure by loss of specialists and entrepreneurs through job shifts out of scientific or technology activity. It follows from such prognostic that R&D system must be

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radically transformed. But how to judge the innovations related to market introduction - as creators or distracters of S&T, of skills and of development potential? Recently the interaction between science, technology, industrial and commercial activity – innovation processes - became the purpose of analysis. Notion of innovation is different than R&D or S&T and has its proper rules and determinants. Innovation is an affair of entrepreneurs who use the researchers' work, adapting market mechanism and public structures. The reforming of institutions, in question with innovation in Central Europe, is at the analogous trajectory as in the main European and North American countries and the transformations are more rapid and radical than in any of them. The urban consumer's demand in CEE shifted definitely to information and communication technology. Still, why some countries have taken a turn economically and scientifically for the worse after fifteen years of effort and market introduction? How one can determine the demand and offer of S&T policy in general social and political context? How to enhance public awareness of the benefits of innovation? What government should be doing for enforcement of national knowledge economy?

The aim of this book is to provide insights into the impact of several important and interrelated developments of R&D on restructuring of innovation and industrial systems in Central Europe and Russia. It deals with subjects pertaining to different research areas: the efficiency and evolution of legal and fiscal framework; the monitoring of innovation processes on a regional basis; co-operation of research centres and intermediate organisations with firms, the evaluation of technical and technological innovation efficiency.

The priority is given to three themes. The first deals with the elaboration of national strategic policies in R&D. The complexity of the transformations in Central Europe creates uncertainty when attempting to forecast the economic and social restructuring. Institutional transformations have till now resided mainly in privatisation and liberalisation. However, a long-run view needs other types of institutional innovations. Among them those favouring the development of knowledge-based society. One question is how do the countries lacking IPR laws and especially those experiencing enforcement difficulties, as the enforcement mechanism may reside outside the law. In this book we pay attention, for instance, to the role of corruption, which circumvent the law, in the process of new technology diffusion. As the elaboration of R&D policy requires the improvement of decision-making tools, we investigate more technical issues. This seems crucial, as the nature of investment policy at national level is essential to the dynamics of industrial restructuring.

The second theme deals with firm governance and innovation. In this field, we examine some stylised features of corporate restructuring in

connection with technological innovative performance. We analyse the evolution of R&D in the large firms, using Polish example. Besides, we pay attention to the development of small firms and to the change in innovation processes linked to this phenomenon.

The third theme is related to integration and international technological diffusion. We explore the relationships between the processes of trade integration, industrial specialisation, and the impact upon employment patterns and the demand for skills. The extent to which the integration of CE countries into the EU is linked to an upgrading of technology, as well as foreign direct investment's (FDI) and high technology's impact on export - import specialisation are points of particular interest.

Our research benefited from varying approaches, offering a differentiated picture of R&D and restructuring process. The competencies of authors are specific. Irina Peaucelle uses juridical and economic approaches to analyse the efficiency of policies to stimulate the innovative activity. Game theory modelling and simulation exercises are used in Svetlana Arkina's and Mark Levin's papers to describe the alternative modes of behaviour concerning the R&D profit sharing, intellectual property rights (IPR) enforcement, tax policy and corruption phenomenon in technology transfers. The primary purpose of Veniamin Livchits' paper is to discuss, summarise, and compare some investment project evaluation methods. Slavo Radosevic carries out an extensive review of the literature on restructuring innovation systems in Central Europe and Russia. Michael Landesmann looks at the trade specification at the detailed product level to measure product quality gaps and patterns of vertical and horizontal trade specification. He also analyses productivity and wage developments at the detailed branch levels. He compares the position of CE products with those of Southern European economies and with the catching up economies of South-East Asia. Lucja Tomaszewicz combines the data from FDI survey with input/output method on intersectoral linkages. The main effort by the Lodz Institute of Economics is directed, on the one hand, to collecting and analysing of empirical data in 200 Polish largest enterprises (Stefan Krajewski), and to surveying small technology-based firms, on the other hand (Krzysztof Matusiak).

The first chapter in this volume opens Irina Peaucelle's paper, which examines laws and their recent modifications governing intellectual protection, the quality of enforcement of these laws, and their likely influence on the investment and innovation performance. Since, there is no systematic knowledge of whether different countries actually do have substantially different rules that might explain differences in their skills and technological

policy. Indeed the IPR laws became similar, but the enforcement mechanisms vary from one country to another and are greatly affected by law, traditions and mentalities. As a law is in a sense an incomplete contract, negotiations and bilateral agreement exemption may determine the modalities of knowledge transfers as well as the scope of real IPR. It seems that in today's Russia the role of tacit agreements in technology transfers is too large to allow the evaluation of their market share. Therefore the technological innovation systems seem to be only remotely dependent on IPR. The problem of benefits and costs of patent protection in a new unstable market environment is rising. As it follows from the Polish contribution to the Project, the analysis of SMEs operating in the traditional Polish industries (textiles, food, metal, engineering, furniture) shows that these firms use external sources of innovations to an insignificant degree basing the changes introduced in the firm on the owners' own ideas and, to a smaller degree, on the employees' new ideas. License purchase as sources of new products represents only five percent of the total. That is why certain doubt is expressed as to the necessity and possibility to enforce or to strengthen the IPR in Russia and in Poland.

We are also interested in the occurrence and institutionalisation of corruption in Russia and in the limits of IPR enforcement in this context. Developing the ideas initiated by Chin and Grossman<sup>2</sup>, Mark Levin analyses both the effects of IPR violations and of corruption on the welfare of innovative and adopting countries. For this purpose he proposes some formal models. The welfare effects depend on two types of IPR law. One IPR system prohibits the technology transfers and the other system favours the licensing which allows the follower to adopt the process innovation. Corrupters may be introduced in different situations. In the case when the transfer of technology is prohibited but occurs, it is supposed that corruption occurs in both countries innovator and adopter. If the transfer is authorised, the innovator may bribe the follower and transfers the technology of lower quality than the technology contracted by the licence. Some simulations illustrate the margins of optimal IPR enforcement and of corruption for innovator, for adopter and for the welfare of both. In certain conditions on the technology market and in function of R&D efforts, corruption may play a positive role in new technology diffusion.

The competitiveness of Central Europe countries and New Independent States on EU markets, particularly on their technology intensive segments, lies at the heart of the empirical issues studied in second chapter. The current process of east-west European integration is a particularly striking example of

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<sup>2</sup> Chin and Grossman (1990) "Intellectual property rights and North-South trade" in Jones R. and Krueger A. (eds) *The Political Economy of International Trade*, Blackwell, Cambridge, MA

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the re-emergence of strong trade and, more generally, production linkages between two groups of economies which, albeit geographically close to each other, have had minimal trade and FDI links over a forty-year period. The rapid and deep liberalisation of external relations after 1989 has led to a dramatic process of trade re-orientation and also to a rapid build-up of pressures towards a new pattern of specialisation in accordance with global market pressures. Thus, strong deficits in skill- and technology-intensive branches emerged, an accentuation of specialisation towards labour-intensive branches and a decline of capital-intensive branches could initially be observed in central and eastern Europe's trade specialisation with the west.

Careful studies by Michael Landesmann of the relationship between trade structures, FDI flows and labour-market developments show significant effects of evolving international trade patterns, FDI and migration flows on employment and wage structures in the west. It is clear that this topic is of great relevance for east-west European relationships and particularly for countries with close geographical proximity to each other. We take into account that the development processes in central and eastern Europe are characterised by rather strong heterogeneity: certain regions, segments of the company sector and of the labour market are developing rather rapidly, other regions and segments are stagnating or lagging strongly behind. Consequently, the evolution of demand structures, the access to capital markets and to skilled labour show strong features of segmentation. Under such circumstances, competitive pressures are strong within segments but weak across segments, although the boundaries between segments are shifting as modernisation gains momentum in the CE economies. Detailed export prices are calculated per exporting country. Quality differences are assumed to account for price differences. A "price/quality gap indicator" framed on this basis is used to code exporting countries. This computing reveals a substantial price gap between CE and NIS exports to the EU. Hungary, the Czech Republic, Poland and Slovenia have moved up the product quality ladder, while Bulgaria, Rumania and Russia have very much lagged behind. These latter countries usually operate at the lower-quality end of product ranges.

The impact of foreign capital in the short and middle run is a frequently discussed issue in the literature on technological transfers. No doubt, capital inflows may be an important source of investments in a country suffering from capital shortage. Moreover, foreign direct investments are a source of new technology and know - how transfers, as they are incorporated in human capital. But capital inflows may be linked to big profit outflows. From the latest investigations in Poland, by Lucja Tomaszewicz, it follows that FDI-receiving firms, whose real growth is positive, have slowly but substantially increased the

level of their investments. Two-third of the firms, which benefited from FDI, entirely reinvest their profits, and a growing number of them use completely new technologies. Positive externalities associated to new technologies, such as improvements in the economic environment local firms benefit from, should also be taken into account. New technologies mostly come from Canadian, Austrian, British and American investors and mainly affect the computer and printing industries.

The third chapter concerns the R&D transformations at sector and firms level. The first of articles on industrial restructuring analyses the pertinence of technology innovation activity in Russia, after the rapid spreading of industrial markets. To assess the correlation between the decrease in R&D funding and the degree of research activity decline in Russia an industry by industry study will be required if the results are to be substantially improved. Therefore Vladislav Boussygine and Mark Levin direct their attention to the detailed analyses of the R&D expenditures and innovation activity in seventeen manufacturing sectors of the Russian Federation in 1995-1997. Certainly the length of the data series is too short to track down the consequences of funding reduction in some sectors, but the picture is rather expressive of today's situation resulting of previous effort and sudden rupture. The authors present the industries' effort to innovate, the structure of expenditures within these industries, and reveal some homogeneous groups of industries from an R&D expenditure perspective. The industries are regrouped according to their capacity to innovate with profits. The study of the likelihood of the short run effect of expenditure on the R&D output is performed and reveals that the industries are heterogeneous with regard to the structure of their R&D expenditure. Consequently to these observations, we took an interest in checking if expenditure amounts and structural differentiation of expenditure within the manufacturing sectors correspond to any national priorities of industrial reconstructing or if they are the result of independent decisions of firms. Some explanations concerning the latter point may be found in Slavo Radosevic's work. According to his ranking of the innovative firm objectives in CE and EU countries, the first place in both groups is occupied by the target of product quality, then comes the target to increase the market share and to extend the market range within the main field. Specific objectives for CE countries are the following: creation of new markets and the lowering of costs through the material and energy saving. By contrast EU firms seek to reduce their expenses through labour cost reduction.

Next three articles are about research studies in the area of R&D for firms that are focused on capability issues. The available data for the Central Europe does not allow Slavo Radosevic to examine the relationship between firm size and innovation to an extent that it can be done with the EU enterprises' surveys. However, the limited available data do provide him with some new

insights. The share of innovative firms is significantly larger in the group of large enterprises. In that respect the firm size - innovation relationship in CE countries seems to be the same as in the EU economies. The only difference between the EU and CE countries is a very low share of small innovative firms in the category of up to 50 employees in the Central Europe. Initially Poland presented an exception among these countries, as a very high share of innovative small firms was registered in 1992. This share has fallen since this period, and some elements of an answer to this decrease may be found in Krzysztof Matusiak's paper. Indeed he captures through SME perception that special survey reflects the weakened role of Polish governmental agencies in supporting the firms' development. For example, according to managers, the governmental institutions are of assistance in entrepreneurship and technology transfer to very small percentage of the technology-based firms. Numerous managers considered that governmental policy was the third most important barrier for the development of this group of firms. For large number of the firms the policy of the central or of the local authorities causes significant obstacles for their operations, in particular in areas of technical progress, of science and of inventiveness. Issues concerning production and product certification, as well as labour law were also acknowledged as essential but insufficiently enforced. The analysis of the importance of particular areas shows that the most meaningful problems were connected with the intellectual property protection.

Stefan Krajewski, by contrast discusses the changes in the large firms in Poland during the period of economic restructuring, using the survey of 200 largest enterprises in different manufacturing sectors for the years 1990-1997. He presents the results in term of production growth and equipment modernisation of firms, analysing the forms of privatisation, the management rules in investment and innovation activities, and the modification of financial structure.

The fourth chapter in this volume deals with some theoretical issues and with institutional transformations in R&D spheres. Two articles offer a framework of comparison of project evaluation techniques and of innovation fostering policies. Indeed some forms of investment may have stronger effects on growth and restructuring than others. Considering the decision making criteria it is important to estimate accurately the degree of risk and profitability of investment projects. It helps us to understand the advantages and disadvantages of these methods, as well as which should be used in economically unstable environment. Veniamin Livshits an al. shows that the acceptance of project in market economy depends on the method one uses to estimate the total investment amount and the requirement for equity capital. The difficulties in the current Russian context for project appraisal lie in the high

degree of uncertainty about: expectations of internal and world inflation rates, of the exchange rate, of the discount rate; whether evaluation is done over the whole life time of the project in dollars or in national currency, and with respect to the timing of credit repayments.

To study public policy in the domain of innovation, Svetlana Arkina models the relationships between regional fiscal policies and investment decisions, in particular FDI. Such a model illustrates some reasons why the investment decreased in the recent past in Russia. Investor behaviour is formalised taking account stochastic technological environment. The decision to invest depends on price variations, and on the probability of capital loss in case of radical institutional transformation (nationalisation, for example). Scenarios of investment dynamics were simulated by the introduction of different tax rates and of different lengths of time for tax exemptions. It is shown that the optimal investment behaviour implies a 'good' choice of the moment when to start investing, using the information on previously described parameters. The optimal regional policy lets the period of the exemption adjust so as to maximise the total discounted volume of tax collected once the investment project is carried out. The tax policy efficiency is appreciated on the example of Novgorod region of Russian Federation.

Summarising, this volume can be considered as the materialised product of a co-operation between all the researchers of the group, who tried to look at both conceptualisation aspects of the research topic and at the pertinent empirical details leading to particular studies.