

**BEYOND TRANSITION:
SYSTEMS OF INNOVATION, AND GROWTH
PERSPECTIVES IN EASTERN EUROPE**

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Inaugural lecture, November 15, 2007¹



**Beyond Transition:
systems of innovation and perspectives
on growth in Eastern Europe**

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SSEES

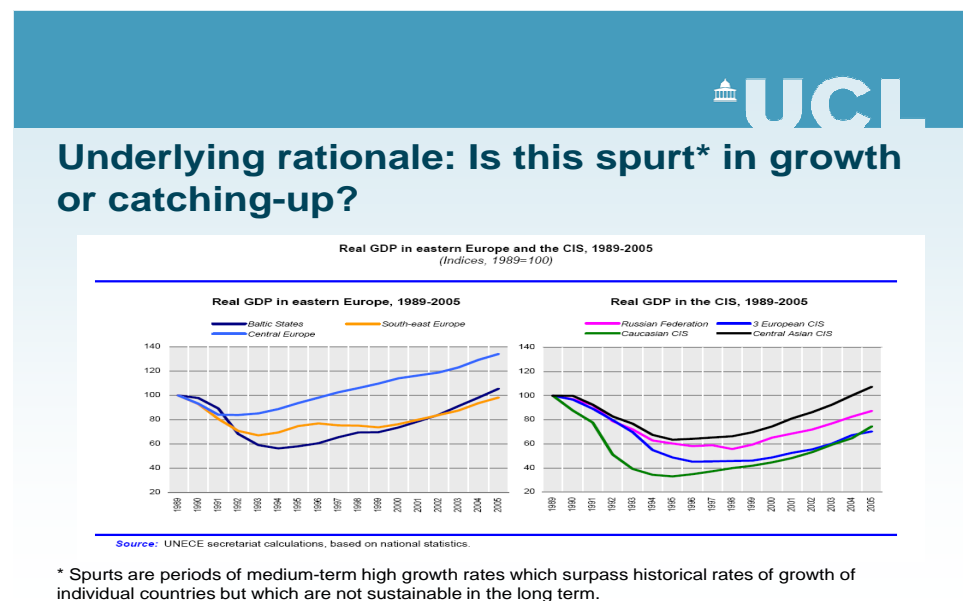
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¹ This is an edited version of the transcript of my professorial lecture. The content is substantially the same with the addition of references. I am grateful to Cynthia Little for editing assistance.

This is a very exciting moment for me. Those that know me, know that I normally do not have a problem presenting, but I do have a problem speaking in front of so many people that I know so well: I feel it a great responsibility. So, for the first time I admit to being a bit stressed.

Before I start I want to express my gratitude to David Dyker and Baroness Margaret Sharp for giving me opportunity to work in UK; if it had not been for them probably I would not be here today. I am enjoying my time at UCL and SSEES, and I am very pleased to see you all here this evening.

This is one of those occasions when one has to show what one has been doing all this time. I have tried to prepare something that is perhaps rather ambitious, but I will try to present it as a kind of story. So, my story is about my perspective on growth in Eastern Europe (EE). So, what is the rationale or motivation for this story? It is the fact that the economies of all EE countries are now growing.



This first slide shows all these countries coming out of transition recession and growing at 3 to 8 per cent annually. And, the question that underpins my lecture today is what is the basis of this growth? Is it a kind of growth spurt or is it a catching-up. What is a growth spurt? Growth spurts are those periods of medium term, high growth, when a country grows much above its historical rate, but at a rate that is not sustainable in the long term.² So my question is whether this growth in EE is sustainable? What is the basis of this growth? The argument and the perspective that I will employ, have something to say about this.

² For further clarification see Hausman, R., Pritchett, L. and Rodrik, D. (2004) 'Growth Accelerations' *Research Working Paper Series* 10566, Cambridge, MA: *National Bureau of Economic*.

An outline

1. System of innovation as an approach to understand growth in EE and alternative options
2. System of innovation perspective applied
 1. Reconstitution of enterprises (organisational capabilities)
 2. Restructuring of R&D system and knowledge base
 3. Restructuring of 'broad' NIS
 4. Integration into global industrial networks
3. Political economy of technical modernization (control/power issues): domestic vs. foreign led modernization
4. Conclusions and policy issues

3

As you see from the outline of my presentation I will first try to explain my own perspective, which has been the basis of my work for the last 15 years. I try to explain it and put it in the context of the two perspectives used by economists. I will try to apply this to the context of EE and analyse their growth from different angles. And then, because this approach is short on political aspects I will add to it a political economy perspective which I think enriches our understanding of the economy. And, as I always want my research to be useful, I will try to draw some policy implications from the analysis.

So, let me first explain what is a system of innovation. You might call it a system of technological accumulation, but system of innovation is the expression in common use. A political economist such as Robert Gilpin,³ would say that the national innovation system is an important aspect of the national political economy – as are the financial system, the production system and the political system; the technological system is one aspect of the political economy of a country. A Swedish colleague, Charles Edquist, would define a system of innovation as 'all important economic, social, political and organizational, institutional, and other factors that influence the development, diffusion and use of innovation'.⁴ Well, this tells me something, but it is a very rough definition. Probably the best known definition in the literature is from the guru in our area, Chris Freeman, who unfortunately is unable to be here tonight. Chris Freeman, based on his work on Japan, coined the term national innovation system. So he says the national innovation system, which he defines as 'the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies',⁵ and this has become a kind of accepted definition. Nevertheless, there is a lot of disagreement about how to define system of innovation, and I myself have written about it,⁶ but for today's lecture, I

³ Gilpin, R. (2001) *Global Political Economy: Understanding the International Economic Order*, Princeton, NJ: Princeton University Press.

⁴ Edquist, C. and Johnson, B. (1997). 'Institutions and Organizations in Systems of Innovation', in C. Edquist (ed.) *Systems of Innovation: Technologies, Institutions and Organizations*, London and Washington: Pinter/Cassell Academic, page nos.

⁵ Freeman, C. (1987) *Technology Policy and Economic Performance: Lessons from Japan*, London: Pinter.

⁶ Radosevic, S. (1998) 'Defining Systems of Innovation: A Methodological Discussion', *Technology in Society* 20: 75-86.

think Chris Freeman's definition will work.

What is system of innovation (system of technology accumulation)?

- NIS - important aspect of a particular nation's political economy (Gilpin, 2001)
- S/ = 'all important economic, social, political and organizational, institutional, and other factors that influence the development diffusion, and use of innovation' (Edquist, 2006)
- NIS: 'The network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies' (Freeman, 1987)
- 'Narrow' (organisations) vs. 'Broad' (institutions) NIS

4

Within this definition, we can distinguish between 'narrow' and 'broad' NIS. 'Narrow' NIS are all organizations that are explicitly in charge of producing new knowledge and using that knowledge, e.g. universities or R&D institutes. What constitutes a 'broad' NIS? Well, think about tax systems –tax systems generally are not designed in order to promote technology; they are designed to collect money for the budget. But they have an effect on the innovation activities of enterprises through the treatment of gross fixed capital formation or investments in knowledge. And there are other aspects of society that have an effect on knowledge generation, utilization and diffusion. For example, think of labour relations and the effects of very flexible labour markets on the range of skills, compared to those of rigid labour markets. In the first case we have external flexibility and a specialized labour force; in the latter case we have internal (intra-firm) flexibility and a broadly skilled labour force. They have very different effects on knowledge diffusion and how innovation develops at firm level. Such examples suggest that almost all societal subsystems have indirect effects on how knowledge is generated, utilized and diffused in the economy. So, we call this a 'broad' NIS although we are aware that there are no clear boundaries to this system.

In the last 20 years (since the end of the 1980s) the dominant perspective among economists for studying growth in the EE countries has been the so called 'transition economics' perspective⁷. Obviously this is not what I am talking about; so I need to explain where I stand in relation to the transition perspective.

⁷ For a comprehensive overview see L. Mickiewicz, T. (2005), *Economic Transition in Central Europe and the Commonwealth of Independent States*, Basingstoke: Palgrave Macmillan

Transition perspective: deficiency and departures

- ‘The advice to EECs was based on economics as the theory of markets which completely ignores the organizational side of the economy’ (Ellerman, 2001).
- Organizations are more than mere players in a game to allocate resources efficiently (Moran and Ghoshal, 1999) - > organizational economics (Simon, 1991)
- Progress towards benchmark > growth
- New Comparative Economics: “economic and social change in each country should be considered *in light of its own institutional possibilities, rather than some idealized view of perfect law and order.*” (Djankov, La Porta and Schleifer 2003) > variety of NIS

5

As David Ellerman, an American economist pointed out: ‘The advice to EE countries was based on economics as the theory of markets which completely ignores the organizational side of the economy’,⁸ and indeed, when you look at the underlying assumptions of ‘economics of transition’ they are largely about markets. Well, is that a sufficient or realistic representation not only of transition economies but of economies in general? Two respected scholars, one of them no longer alive, Moran and Ghoshal, argue that organizations are ‘not just players in a game to allocate resources efficiently’.⁹ Organizations are important players in the market economy, therefore, a theory of a market economy has to include the theory of organizations. And here I want to refer to Herbert Simon, Nobel prize winning economist, who has a nice story.¹⁰ He said imagine that a Martian comes to Earth, and he takes a telescope and looks at it through to see what kind of economics Earthlings have. So, what does he see? Oh, he sees that there are some big green spots, and these are organizations, enterprises. And then he sees blue coloured lines which are the transactions taking place within the organizations, and they are very dense. He sees red lines connecting organizations, which are the market transactions. So, this is an Earthling’s economy? Yes. So how could I describe such an economy where there are so many blue lines or transactions within organizations? I will call it organizational economics.

Obviously this perspective is somewhat different from a perspective that looks at economies only in terms of the market. And, because I am looking at growth from the innovation perspective organizations are very important and must be integral to my perspective.

The second distinction between ‘transition economics’ and the perspective that I want to apply here is in how we see the relationship between institutions and growth? From a comparative economics perspective, growth could be assessed based on the distance of countries from the benchmark. What do we use as the benchmark? The benchmark

⁸ Ellerman, 2001, Email communication

⁹ Moran, P. and Ghoshal, S. (1999) ‘Markets, Firms, and the Process of Economic Development’, *The Academy of Management Review*, 24(3): 390-412.

¹⁰ Simon, H.A. (1991) ‘Organizations and Markets’, *The Journal of Economic Perspectives*, 5(2): 25-44.

is an imaginary economy, 'an open market economy', that has a certain set of institutional features. Here we can refer to the conceptual model depicted in the EBRD (European Bank for Reconstruction and Development) transition indicators, where we can trace 27 post-socialist economies in terms of how far away they are from this ideal model.¹¹ So we have a best practice model and we can trace institutional changes in these countries. The logic is that their growth will be closely related to the distance from the best practice. The closer a country is to the best practice the better we would expect its preconditions for long-term growth to be.

This model was used during the 1990s and early 2000s to explain differential growth rates across transition economies. At the same time, we are in the period when 'transition economics' is being questioned, and especially in terms of the questions about comparative economics. And here I would like to quote a group of economists who were very much involved in 'transition economics' and who, after all this experience over 15-20 years, arrived at an understanding that is summarized in this quote: 'Economic and social change in each country should be considered in the light of its own institutional possibilities, rather than some idealized view of perfect law and order' (Djankov, La Porta and Schleifer, 2003)¹² (emphasis added). Now this is radically different from the first assumption that says 'I know what the benchmark is and I know how far we are from the benchmark'. But why is this new position important for me? It is because it is a different philosophical point and it allows for something that is impossible in the first assumption: it allows for a variety of national innovation systems, which means that there are different innovation systems that can be equally conducive to growth. And there is no one best practice model. So, this assumption serves me as a point of departure. It is one kind of perspective that I could use, but I also want to show you the problems in using this perspective.

Problems with traditional growth theory based on production function

- Aggregate view of growth $Y = A(K, L)$
- What A may contain: technology (LBD), lower costs (LBD), externalities, sectoral composition, ... (Easterly and Levine, 2001)
- Technology as a black box
- Technology is not a simple process of conversion of inputs into outputs ... but, the process also operates in reverse
- It considers TP as solely driven from the supply side, neglect of demand side
- Etc.....

6

¹¹ European Bank for Reconstruction and Development, (various years) *Transition Report*, EBRD, London.

¹² Djankov, S., Glaeser, E., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2003) 'The New Comparative Economics', *Journal of Comparative Economics*, 31(4): 595-619.

The other perspective that I could use is traditional growth theory, which is based on the production function. In a nutshell, this model explains economic growth based on investments in capital (K) and labour (L) i.e. I am trying to explain growth through factors, but obviously not all growth can be explained by factors, part of it is unexplained and is represented by the residual (A). It misleadingly referred to as total factor productivity (TFP) or as some economists describe it as a 'black box' (Rosenberg) or 'a measure of our ignorance' (Abramovitz).

So what is it that is left out of the model and is represented by the residual? This is important for me as it may have something to do with technology. Two very respected economists, William Easterly and Levine,¹³ reviewed literature that tries to understand what the residual actually includes. They list a variety of things such as technology and lower costs, which emerge through learning by doing, various externalities or spillovers, sectoral composition, etc., etc. In other words, we are very unsure as to what A contains. However, Easterly and Levine emphasise how important it is to find out what determines A. And I am one of those who try to work within that A if you like, or within this black box. And I cannot take an aggregate view of technology because it does not tell me much. In fact, knowing the share of A is not very relevant for policy making. But I do want to understand what is in that black box. So, I am not satisfied by an aggregate figure and an aggregate view of the growth. In a way, I am trying to show you the limitations of these two alternatives and why I am in favour of yet another track. There are numerous other objections to this other approach, some of which are highlighted on the slide; however, I do not want to deviate too much from my main line of my argument.

So, I position myself in relation to the dominant views on technology and growth and I make it clear that I take the systems of innovation approach to growth. So, an important question arises: where does this approach stand in terms of micro, meso, macro criteria?

¹³ Easterly W. and R. and Levine (2001) 'It's Not Factor Accumulation, What have we learned from a decade of empirical research on growth?' *World Bank Economic Review* 15: 177-219.

System of innovation approach to growth: micro - mezzo – macro levels

1. Firms: repositories of capabilities and arena of governance

The firm is not only **key repository of organisational capabilities** but also 'the original, most important point of permeable contact between state and society' (Seleny, 2006, p. 130) i.e. **the key political economy unit** and reflection of state – society governance

2. SI's production theory: interactive dynamic capabilities approach (von Tunzelmann and Wang, 2007)

External sources of knowledge play a major role in the accumulation of the stock of knowledge of firms (Malerba, 1992; see taxonomy)

3. NIS emerges in mutual interaction of different subsystems

(Freeman) (science, technology, business, market, finance, foreign trade, government, culture, etc)

> it is co-evolutionary process where major mechanism is not tendency towards equilibrium but (mis)matching between different subsystems

- 'when it rains, it pours: all factors flow in the same direction' (Easterly & Levine, 2001) > complementarities

7

Well, unfortunately it encompasses all three levels, which may be good thing, but makes for a very complicated methodological problem. We start from the importance of organizations or firms. Firms in this approach are repositories of capabilities, but where do these capabilities reside? They reside in part in individuals' knowledge, but we can often produce something only in cooperation with other people, i.e. in a group - and then groups of people can produce much more. So the nature of capabilities is that they are a collective phenomenon. At the same time, firms are arenas of governance. They are organizations embodying all the political and institutional features of the society and the economy. They are a political economic unit of the economy in which the type of market system and the firm level governance system affect the nature of capabilities: it is this that I shall try to demonstrate in the context of the EE¹⁴.

So firms are essential agents in this perspective. Next, what is the production theory in this perspective on growth? Firms are important in this perspective, but external sources of knowledge also play a major role in the accumulation of the stock of knowledge of firms.¹⁵ So firms operate in a broader institutional and knowledge context - what is that context?

¹⁴ Seleny Anna (2006) *The Political Economy of State-Society Relations in Hungary and Poland. From Communism to the European Union*, Cambridge University Press, NY

¹⁵ Malerba, F. (1992) 'Learning by Firms and Incremental Technical Change', *Economic Journal* 102: 845-859.

Interactive dynamic capabilities approach (von Tunzelmann and Wang, 2007): opening the black box

| Source | Internal | External |
|---------------------------|---|---|
| From production | Learning by doing | Learning by spillovers from competitors and from horizontal linkages |
| From consumption | Learning by using products, inputs, mach. | Learning by interacting with suppliers and buyers |
| From technology suppliers | Learning from R&D and training | Learning from education and /S&T of 'technology/ knowledge suppliers' |

Competencies - a *potential* for growth enhancement \Rightarrow **Capabilities** – harnessing competencies effectively
Interactive - producing products that are compatible with the capabilities of customers' needs and suppliers' knowledge
Dynamic - reproducible in 'real time' i.e. they are changing.

TC depends on a variety of learning mechanisms: upstream, downstream and laterally '

8

The above slide suggests one of ways we can think of firms and their broader context in terms of learning. Why learning? Well, learning is the key process through which firms and organizations in general, develop and interact. Learning is essential to the generation and utilization of technology.

The approach that I find inspiring was developed by my colleagues Nick von Tunzelmann and Qing Wang¹⁶ and builds on the work of Franco Malerba.¹⁷ Let me explain why Nick and Qing call it the 'interactive dynamic capabilities approach'. First, learning can take place within firms, usually described by economists as 'learning by doing', the idea being that the more I produce the more I learn. And very often this learning is described wrongly as costless: it is not. Second there is 'learning by using' products, inputs, machinery. We learn as producers and users, but we learn also as a result of conscious undertaking of R&D and training. So, this is active learning within enterprises, as opposed to learning by doing and learning by using, which can be considered examples of passive learning. Equally important is the learning that takes place outside of firm, i.e. through interactions with external actors. One of these types of learning is 'learning by spillovers'. Companies learn from competitors or from companies with which they have horizontal linkages. Companies learn by interacting with suppliers and buyers, and the depth of the learning from these sources depends on the depth of the suppliers' and buyers' learning. And companies learn through education and science and technology; they learn from universities, from R&D organizations, from sellers of patents and licences, and so on. So within this perspective a system that is conducive to a variety of learning mechanisms, which, in turn, generate more advanced technological capabilities, is more likely to generate long-term growth. That sounds logical, which is why, in this approach which is a kind of basis of this perspective, learning is interactive. It is a

¹⁶ von Tunzelmann, N. and Wang, Q. (2007) 'Capabilities and Production Theory', *Structural Change and Economic Dynamics*, 18: 192-211.

¹⁷ *ibid.*

social process which occurs within organizations, but also, and equally importantly, across organizations and with other organizations.

Why are we talking about capabilities? Well we need to distinguish between competencies and capabilities. Essentially EE is a region where, relative to the level of national income the labour force has a high level of education, i.e. better competences. For example, statistics for Lithuania and Estonia show that 40% of the population have university degrees. So do these people have competencies? Perhaps they do. Do they have capabilities? Well we don't know. Probably they have fewer capabilities because capabilities arise only when competences are harnessed effectively. Competencies or knowledge are not automatically converted into capabilities or on-the-job skills. Capabilities are most often firm specific and can be developed only within a specific organizational context. And this is something that requires learning organizations, market pressures but also mechanisms for knowledge sharing and various market and non-market incentives.

Finally, why is this a *dynamic* approach? It is dynamic because the capabilities have to be reproducible in time through organizational routines. Also, in a market context capabilities have to be continuously adjusted and improved to meet new consumer requirements. And growing organizations need to develop mechanisms that will allow them to improve and add new capabilities. Thus, within this perspective technological change depends on a variety of learning mechanisms, that go upstream, downstream and laterally. This is the reason for our description of 'system of innovation', because technology is also systemic.

And my third point is how does a successful national innovation system emerge? It emerges through the mutual interaction of different subsystems. This explanation again refs to Christopher Freeman's investigation of the British industrial revolution where he finds that good complementarity between different social subsystems generated the dynamism that led to a profound change in the whole economy.¹⁸ So in this context, what matters are the co evolutionary mechanisms, how these systems coevolved, and how the complementarities between the education, science, business and foreign trade systems evolved and changed one another. And how ultimately these mutual complementarities produced economic development. This thinking, which is based on the idea of complementarity, is not just the thinking of a neo-Schumpeterian economist. Again, I refer to Easterly and Levine (2001)¹⁹ who, when referring to catch-up said, 'when it rains, it pours; all factors flow in the same direction', because growth does not happen every day – but when it does happen it comes in a deluge, it 'pours', as any traveller to contemporary China can confirm. And when does it pour? When you have so many mutually reinforcing complementarities between different societal sub-systems including external environment that they jointly generate catch up

¹⁸ Freeman C. (2002) 'Continental, National and Sub-national Innovation Systems— Complementarity and Economic Growth', *Research Policy* 31: 191–211.

¹⁹ *ibid.*

Reconstitution of enterprises (organisational capabilities)

So these are three perspectives on growth, and three levels of systems of innovation, which is the perspective on growth that I will try to apply in relation to EE. We will start from the micro level, at the level of the enterprise, and from organizational capabilities. And we start with Socialism because that is a legacy, the legacy being that the Soviet enterprise was not a 'normal' enterprise. If you want to define it, you could describe it as a production unit with 'dislocated' business functions. Why? Because marketing was the responsibility of foreign trade organizations; finance was job of the ministry of finance; the strategic function was the responsibility of the ministry of planning; R&D was dislocated to branch institutes, etc. So we have a strange animal that needs to restructure and bring all these functions under one roof. This is not so easy because the functions of the enterprise were distributed across a hierarchy; thus, the phrase USSR Inc. captures this well. So, the problem is to put all these functions together: the legacy of socialism is weak, firm specific organizational capabilities. This is the starting point to the systemic problem of how to transform production units into business units or business organizations.

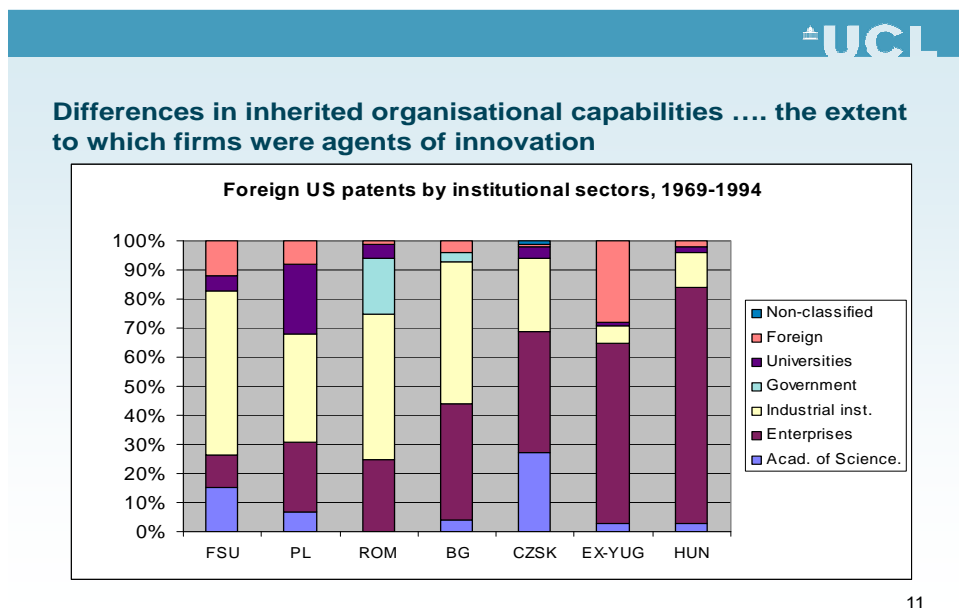
Legacy of socialism

- The Soviet enterprise = production units with 'dislocated business functions'
 - Cf. Governance affects nature of capabilities
- Innovation process planned across hierarchy
- In socialism organizational learning was limited as there was not opportunity for strategic, functional, hierarchical integration > legacy of weak firm specific organisational capabilities
- Post-socialist enterprise => business units

10

In order to illustrate how this legacy operates across different EE countries I have taken the next slide from a paper coauthored with, Djuro Kutlaca, that looked at

patenting activity in EE and the US.²⁰ We looked at who in EE was patenting. But, why this interest? Well, if enterprises were patenting this would mean that enterprises were active in innovation and one of my explanations would be inaccurate. But if enterprises were not patenting this would mean that they were not agents in the innovation process, which would mean that they were not part of a market economy. Our comparisons revealed various things.



This slide shows that Hungary had the largest share of patents from enterprises. In the case of ex-Yugoslavia, both enterprises and foreigners were patentors. In Romania the Ministry was registering patents in the US. In USSR the major patentors were industrial (branch) institutes and the Academy of Sciences. So the historical legacy operated to very different degrees across countries. In some cases, enterprises were the key agents; in others they played a marginal role. So, the starting positions are very different in terms of enterprises reconstituting as business entities. And this applies just to this one function. I won't complicate things more - but hope that the point has been made.

So we have a situation where enterprises have to be reconstituted, and have to be reconstituted as business entities, which involves some challenges. The first challenge is that any production and continuous improvement to one product requires the integration of various functions - finance, R&D, engineering, procurement, production and sales. I would describe this challenge as 'system integration at product level' as it is only when these functions are brought together into a coherent organization that we can achieve something that is marketable.²¹

²⁰ Kutlaca, D. and Radosevic, S. (1999) 'Technological "Catching-up" Potential of Central and Eastern Europe: An Analysis Based on US Foreign Patenting Data', *Technology Analysis & Strategic Management*, 11(1): 95-111.

²¹ See Radosevic, S. (1999) 'Transformation of S&T Systems into Systems of Innovation in Central and Eastern Europe: The Emerging Patterns of Recombination, Path-dependency and Change', *Structural Change and Economic Dynamics* 10: 277-320.

The reconstitution of enterprises and production networks in post-socialism: key challenges

System integration at product level =

- production and continuous improvement require integration of different functions (finance, R&D, engineering, procurement, production, sale) whose integration is essential to innovation dynamics.

Process integration at firm level =

- production and innovation have to be organised across several tiers of suppliers which are all involved to different degrees, not only in production, but also in innovation.

12

The second challenge I call ‘process integration at firm level’ – which is what? Well, if you are producing a car you have a lot of suppliers – first tier, second and third tier - sometimes several hundreds of suppliers. They need to be managed; a supplier network is required for countries to produce a complex product. So a key challenge is how can companies build such a network, i.e. integrate the activities of large numbers of buyers and suppliers with their own production activities. The next slide shows areas of upgrading, and the challenges that arise in this process and the progress made by EE. This is based on case studies conducted with colleagues, or projects in which I was the coordinator or a partner.²²

Areas of upgrading of the CEE firms

| Weakness | Area of upgrading |
|---|---|
| Marketing skills, finance, organization | Managerial/functional upgrading |
| Product systems integration capabilities | Product upgrading |
| Network building capabilities at firm level | Process upgrading esp. ‘linkage capabilities’ |

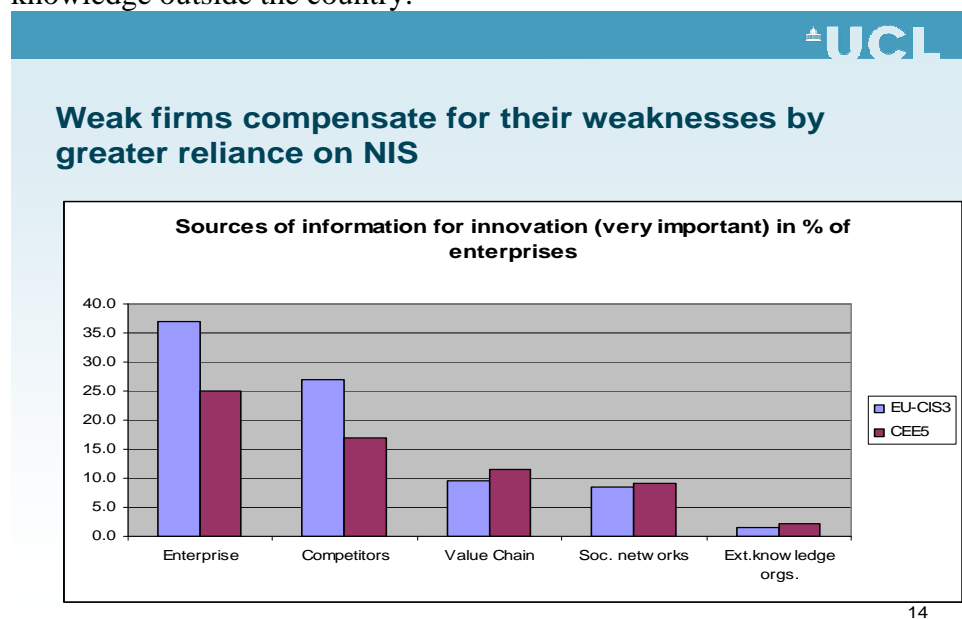
- The upgrading of the CEE firms has been primarily **functional** > (production capability – quality), not discernable upgrading towards R&D and export marketing > the divorce between technology and production capability.
- The capabilities to integrate the system at product level (combining foreign with domestic solutions, customisation, etc.) and organise a network at firm level (manage domestic subcontractors) are still weak.

13

²² See McGowan F., Radosevic S. and von Tunzelmann N. (eds) (2004) *The Emerging Industrial Structure of the Wider Europe*, London: Routledge and Radosevic, S. and Sadowski B. (eds) (2004) *International Industrial Networks and Industrial Restructuring in Central and Eastern Europe*, Dordrecht: Kluwer.

The case studies showed that upgrading primarily has been functional, which means that it has been confined to primary functions within enterprises. The most important improvements at enterprise level involve the production capabilities, i.e. the ability to produce at world level in terms of quality. Typically, companies will export via intermediaries, and will have quite well developed local marketing skills but no export abilities. They probably market under their own brand names but do not do products that are new to the world. So, we most often find a situation of good local production units, but no technology capabilities and weak linkage and networking capabilities. However, this is not unique to EE : companies from so called emerging markets have similar problems and face high barriers to entry to non-production parts of the value chain. However, what is specific to EE is enterprises that have become good producers in terms of their production capabilities, but whose other functions (networking, linkages, non-production functions) are still very much the same as in socialist times. In my view, the very weak firm specific capabilities that EE inherited from socialism have not improved significantly. Moreover, foreign direct investment (FDI) is most often confined to production activities which further reinforces this structural problem.


So, what can weak local enterprises do? They are turning to the local environment to compensate for their own weaknesses and they are trying to rely on sources of knowledge outside the country.



This slide shows data taken from the third European Innovation Survey for the ‘old EU-15’ and averages for five of the EE countries. It is based on questions to enterprises: What is the main source of innovation for your enterprise? Is it based on your own enterprise, or is it information acquired from your competitors because you have seen some good things that they are doing? Is it from partners in the value chain i.e. from your suppliers and buyers, or from social networks (trade exhibitions, which are very important sources, journals, engineering associations), or is it from external knowledge organizations, e.g. R&D institutes and universities. We can see that in the EU-15, the enterprise’s own knowledge is a much more important source of information than in the EE. Also competitors play a much more important role which indicates the importance of invisible links among competitors. But, reliance on other

external organizations, on suppliers, buyers, engineering associations, trade fairs, universities is much more important for EE countries than for the EU-15. Although the difference is not huge it suggests, nevertheless, that EE firms are trying to compensate for weak firm capabilities by relying on the other actors in the innovation system. Therefore, the development of that system is very important: how it developed, how well developed it is.

Towards post-socialist innovation system

- Socialism = firms could not rely on external learning mechanisms the absence of the division of labor in the market (Kogut and Zander, 1999) =>absence of learning by interacting
- Poverty of business strategies in socialism (Yudanov, 1997).
- Anti-innovative bias of socialism is caused by the *organizational singularity*
- Firms were insufficiently specialized in the context of the diversity that constitutes the market.
-  This is *Schumpeterian/evolutionary interpretation* vs. distorted incentives and allocative inefficiencies interpretations

15

So we are talking now about a process - where the whole innovation system has to change its nature. We are moving from a single enterprise towards an enterprise environment. Why is this problematic? It is a problem for socialist firms because they cannot rely on external learning mechanisms.²³ The good firms under socialism were those that remained outside the socialist environment because they had learned to overcome their problems by themselves and were not exposed to the hazards of a centrally planned system. The socialist system was impoverished in terms of the variety of business strategies: it had only one kind of strategy – large volume production. And the system was biased against innovation because there was only one type of firm – there was a kind of organizational singularity. What was missing was something that is essential for markets – a variety of sources of knowledge and strategies, and mechanisms through which enterprises interact. All of these were missing, which meant that firms were insufficiently specialized. So, now EE are faced with the emergence of a new system. Obviously, I am explaining the problems of socialism from a Schumpeterian and evolutionary perspective rather than from a mainstream perspective, which would be concerned primarily with the incentives and allocative distortions in socialism.

²³ Kogut, B. and Zander, U. (2000) 'Did Socialism Fail to Innovate? A natural experiment of the two Zeiss companies', *American Sociological Review* 65(Apr.): 169-90.

How an 'extended order' emerges ?

- A new extended order built on entrepreneurial firms ...
- an emerging variety of types of firms and of strategies: Volume strategy, Niche strategy, Customized strategy, Innovative (pioneering) strategy, Specialized suppliers
-whose evolution is simultaneously linked to the development of an 'extended order' (Kogut and Zander, 1999) i.e. NIS
- 'The narrow NIS almost everywhere are "hybrid" systems embodying complex public/private interdependencies (Nelson, 1996). (...) Consequently the governments of Eastern Europe are having to learn how to manage these hybrid systems....' (Freeman, 2006)

16

So the question now is how will this new system emerge? What will be the basis of this market system? Obviously an extended order, a new kind of innovation system will be based on entrepreneurial firms. Similar to any other market system, we are observing an emerging variety of types of firms and enterprises, which are adopting different types of strategies. What these enterprises do will depend to a large extent on the innovation system, the kind of infrastructure, the kind of market and the institutional support in their immediate environment. Firms operate in an innovation system that has elements of public and private, some of which are created entirely by the market, and others by public institutions and the state. What is most important is that these countries have to learn how to manage these systems. Since they are by definition hybrid systems, this is not easy because the dominant political economy philosophy, at least during the 1990s and early 2000, favoured only market based institutional solutions and was undermining the role of the state in the innovation system.

Restructuring of R&D system and knowledge base

We now move to the second layer, to the broader issue of the R&D system, which is

the system that should contribute to the dynamism and innovation of the economy. In this context we have different types of R&D systems: they can be focused primarily on the enterprise because it is business that is doing the R&D or they can be government or higher education R&D. The next slide shows several models in terms of the R&D sector that is predominant either as a funding source or for performing the R&D, and which countries belong to which model.

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Different institutional profiles of R&D systems

| Dominant performing sector < Dominant source sector | | | | |
|---|-----------|-----------|------------|------------|
| Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| BES < BES | BES < GOV | HES < GO | GOV < GOV | GOV < BES |
| USA | Slovakia | Portugal | Bulgaria | Kazakhstan |
| Ireland | Hungary | Estonia | Azerbaijan | |
| France | Poland | Lithuania | | |
| UK | Belarus | Turkey | | |
| Austria | Croatia | | | |
| Belgium | Russia | | | |
| Finland | Romania | | | |
| Germany | | | | |
| Spain | | | | |
| Korea (Rep) | | | | |
| Slovenia | | | | |
| Czech R | | | | |
| Latvia | | | | |

18

So, we can see that among the EE countries only Slovenia, Czech Republic and partly Latvia have R&D systems that are based predominantly in the business enterprise sector (BES).

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BES dominated R&D systems are feature of countries above \$15Kpc

| | GDP pc 2003 | Model type | Model Dummy |
|-------------|-------------|------------|-------------|
| USA | 29,037 | 1 | 1 |
| Ireland | 24,739 | 1 | 1 |
| France | 21,851 | 1 | 1 |
| UK | 21,310 | 1 | 1 |
| Austria | 21,232 | 1 | 1 |
| Belgium | 21,205 | 1 | 1 |
| Finland | 20,511 | 1 | 1 |
| Germany | 19,144 | 1 | 1 |
| Spain | 17,021 | 1 | 1 |
| Korea (Rep) | 15,732 | 1 | 1 |
| Estonia | 14,340 | 3 | 0 |
| Slovenia | 13,995 | 1 | 1 |
| Portugal | 13,807 | 3 | 0 |
| Czech R | 9,905 | 1 | 1 |
| Latvia | 9,722 | 1 | 1 |
| Slovakia | 9,392 | 2 | 0 |
| Lithuania | 7,986 | 3 | 0 |
| Hungary | 7,947 | 2 | 0 |
| Poland | 7,674 | 2 | 0 |
| Kazakhstan | 7,655 | 5 | 0 |
| Belarus | 7,387 | 2 | 0 |
| Croatia | 7,233 | 2 | 0 |
| Turkey | 6,731 | 3 | 0 |
| Russian Fed | 6,323 | 2 | 0 |
| Bulgaria | 6,278 | 4 | 0 |
| Romania | 3,510 | 2 | 0 |
| Azerbaijan | 3,394 | 4 | 0 |

19

We need to know the relation between these models and the level of development. We can see that basically all countries with a per capita GDP over \$15K are dominated by model 1, i.e. by the BES. Countries with per capita GDP below that level have models that are not dominated by BES R&D. So, what kind of structural change should we

expect to accompany economic growth? We would expect a shift from government owned R&D laboratories to enterprise R&D. So, we are interested in whether and how quickly EE enterprises are moving towards an enterprise based R&D system. This is in part a developmental but is also in part an institutional issue that is specific to post-socialist countries.

The next slide shows the degree of change towards BES as a ratio. Change is the difference between the first and the last available data in the UNESCO database, which is mainly mid-1990s and early 2000s. We are interested primarily in trends or directions of change. The highlighted figures are those sectors where the biggest shifts occurred in R&D employment, the biggest structural shift towards BES being in China, followed by Slovenia and Czech R. We can see that in Russia the share of BES has actually decreased on account of the increased relative share of the government sector. In other countries we can see an increase towards the higher education sector. Growth should go hand in hand with a rising relative importance of BES – but we do not see that happening in many of the EE countries. This tells us that, yes there is growth, but as R&D is not shifting towards the business sector the sustainability of that growth is questionable.

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R&D employment: limited re-orientation towards BES in EE

| Country | Business enterprise | Government | Higher education | Private non-profit | Not distributed |
|--------------------|---------------------|------------|------------------|--------------------|-----------------|
| China | 0.47 | 0.29 | 0.18 | 0.00 | 0.20 |
| China | 0.60 | 0.23 | 0.17 | 0.00 | |
| Slovenia | 0.42 | 0.34 | 0.22 | 0.03 | |
| Slovenia | 0.56 | 0.23 | 0.18 | 0.04 | |
| Czech Republic | 0.48 | 0.34 | 0.19 | 0.00 | |
| Czech Republic | 0.52 | 0.26 | 0.21 | 0.01 | |
| Hungary | 0.31 | 0.36 | 0.33 | 0.00 | |
| Hungary | 0.29 | 0.33 | 0.37 | 0.00 | |
| Lithuania | 0.03 | 0.48 | 0.49 | 0.00 | |
| Lithuania | 0.09 | 0.29 | 0.62 | 0.00 | |
| Russian Federation | 0.64 | 0.26 | 0.10 | 0.00 | |
| Russian Federation | 0.60 | 0.30 | 0.10 | 0.00 | |
| Bulgaria | 0.14 | 0.58 | 0.27 | 0.01 | |
| Bulgaria | 0.14 | 0.66 | 0.19 | 0.00 | |
| Poland | 0.28 | 0.25 | 0.47 | 0.00 | |
| Poland | 0.17 | 0.25 | 0.58 | 0.04 | |
| Romania | 0.71 | 0.23 | 0.06 | 0.00 | |
| Romania | 0.49 | 0.30 | 0.21 | 0.03 | |
| Slovakia | 0.32 | 0.41 | 0.27 | 0.00 | |
| Slovakia | 0.24 | 0.24 | 0.51 | 0.01 | |

Increasing share of BES (China; Slovenia); Increasing shares of BES and HES (Czech R; Hungary, Lithuania); Increasing share of government sector (Russia); Increasing share of government and HES (Bulgaria); Increasing share of HES (Poland; Romania, Slovakia)

20

How much R&D systems have changed allows us to guess at how strong a basis they have built for long-term growth. We see that R&D systems have not changed much. For example, their science specialization did not change much during the 1990s. The science of EE countries based on their publications, continues to be focused around six areas related to physics and chemistry,²⁴ because these were the dominant areas in the 1950s and 1960s when socialist countries were investing considerably in science. Changing that specialization is not easy.

However, at the institutional level we see increasing inter-country differences in the

²⁴ See Kozlowski, J., Radosevic S. and Ircha D. (1999) 'History Matters: The Inherited Disciplinary Structure of the Post-Communist Science in countries of Central and Eastern Europe and its Restructuring', *Scientometrics* 45(1): 137-66.

institutional R&D landscapes. These differences have emerged from different restructuring (active or passive or preservation) policies, and different R&D organization micro-strategies.²⁵ The post-socialist period produced a rich supply of ingenious survival strategies for R&D institutes, with people inventing and trying to find ways to get out of the crisis. The profile of the R&D systems has been shaped by the interactions among these micro and macro strategies. I cannot go into this in detail here, but would just highlight that there were and are differences across countries.²⁶



How much R&D systems have changed?

- **Science base of the ex-socialist countries is (still) firmly based on 6 areas around physics and chemistry**
- **Similar external pressures but big inter-country differences**
 - Policy of active/passive restructuring
 - Policy of preservation
 - Micro strategies

—▶ **An increasingly EU-ized R&D systems in CEE and post-Soviet R&D systems in CIS**

21

From the macro perspective there is increasing divergence between two systems: an increasingly Europeanized or perhaps I should say EU-ized R&D system emerging in the new member states from EE, and a post Soviet R&D system. The latter has seen little change since socialism, although there are some important differences among different post-Soviet countries.²⁷

The story of the post-Soviet R&D system is fascinating. I was privileged to be able to observe very closely one of the microcosms of the post Soviet R&D system - Novosibirsk Akademgorodok - which represents 20 per cent of the Russian R&D system. I would like to tell you more about this, but the time does not allow.²⁸

²⁵ For the case of Russia see: Radosevic S. (2003) 'Patterns of Preservation, Restructuring and Survival: Science and technology policy in Russia in the post-Soviet era', *Research Policy* 32(6): 1105-24.

²⁶ See Radosevic S. (1996) 'Restructuring of R&D Institutes in Post-Socialist Economies: Emerging Patterns and Issues', in A. Webster (ed.) *Building New Bases for Innovation: The Transformation of the R&D System in Post-Socialist States*, Cambridge: Anglia Polytechnic University, pp. 8-30; Dyker, A.D. and Radosevic S. (2000) 'Building the Knowledge-based Economy in Countries in Transition - from Concepts to Policies', *Journal of Interdisciplinary Economics* 12(1): 41-70 (reprinted in Dyker D.A. (2004) *Catching Up and Falling Behind. Post-Communist Transformation in Historical Perspective*, London: Imperial College Press, pp. 252-90).

²⁷ Radosevic S. (2008) 'Innovation Systems of Russia and Ukraine in Comparison with Innovation Systems of other Countries, in N. Ivanova and I. Yegorov (eds), *Russia and Ukraine in the Light of Indicators of the European Innovation Trendchart*, - Kiev: State Committee of Statistics, pp. 70-92 (in Russian).

²⁸ This represents part of some still unpublished research undertaken in the late 1990s and early 2000s in Novosibirsk. For research on another post-Soviet country (Kazakhstan) see

Post-Soviet R&D microcosm: Novosibirsk *Akademgorodok*: some lessons

- ‘Blurring boundaries’ organizational forms (quasi spin offs)
- The more insulated RI is from environment the better are its chances for survival and growth.
- Different models of adjustment of $RI = f$ (structural factors - nature of S&T area) and idiosyncratic (management, history).
- The absence of NTBFs in Russia cannot be understood within the linear innovation process perspective (*vnedrenye*) but only within the interactive innovation process perspective
- In institutionally undeveloped environment, the scope for technology based growth and competition is extremely limited

22

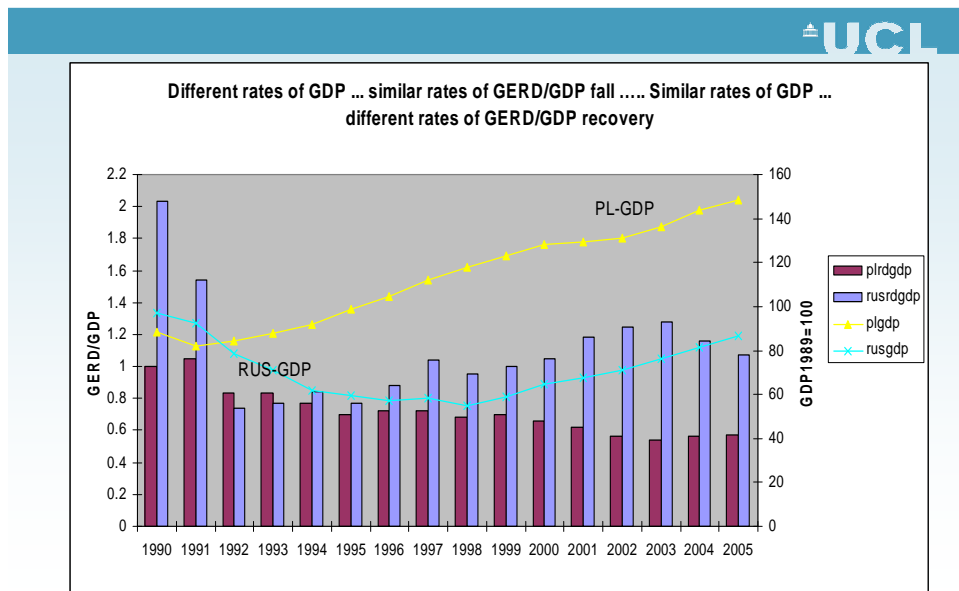
‘Broad’ NIS

- demand for technology vs. market demand -

Now we move to the system level which is a more complicated area. For example, how did systemic changes affect the system of innovation and generation of technology? I have looked at the area of ‘broad’ NIS although not very systematically.²⁹ Here, I confine myself to a few hints, and to pointing out one of the crucial factors for shaping NIS in EE - the issue of demand.³⁰

Radosevic S. and Myrzakhmet M. (2009) ‘Between Vision and Reality: Promoting innovation through technoparks in an emerging economy, *Technovation* 29(10): 645-56 ,
²⁹ See Radosevic S. (1995) ‘Science and Technology Capabilities in Economies in Transition: Effects and Prospects’, *The Economics of Transition* 3(4): 459-78 and Kutlaca D. and Radosevic S. (2006) ‘Macroeconomic Regimes and Changing Cost Structures in Central and Eastern Europe’, *Acta Oeconomica*, Akademia Kiado, Budapest 56(1): 45-70.
³⁰ See Radosevic S. (2004) ‘(Mis)match between Demand and Supply for Technology: Innovation, R&D and growth issues in countries of Central and Eastern Europe’, In Filho W.L. (ed.) *Supporting the Development of R&D and the Innovation Potential of Post-Socialist Countries*, Amsterdam: IOS Press, pp. 71-82.

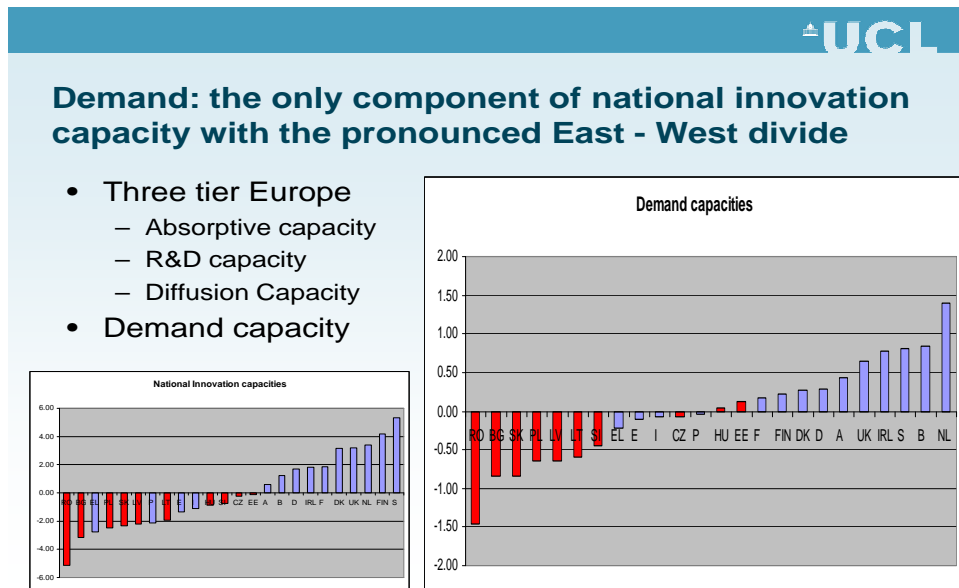
During the early 2000s many EE economies were growing driven largely by local demand. However, in an innovation studies context, this does not mean that these economies were automatically generating demand for local R&D and technology. Demand for products and services and demand for technology do not equate. To illustrate this, the next slide shows figures for Poland and Russia. Here we have two economies and their GDP and R&D figures. We can see that the Polish economy declines slightly, but then grows; the Russian economy declines much more, but then recovers. Ultimately both economies are growing at almost similar rates. But what about their investment in R&D (rdgdp)? Here we have Russia, which has invested much more, and Poland which has invested much less, but overall R&D expenditures are at a relatively similar level although the declines were very different. When the economy started to grow we see that the economy in Poland was growing, but R&D was stagnating and then going down and in Russia we see that it increased. So what was driving all of this? Was there a sudden demand for local R&D in the Russian economy, and was this healthy growth? Nothing could be further from the reality. It was based simply on government investing more money, making it a largely public sector. But what is the basis of Poland's growth and why is its level of R&D declining?



We have the problem of stagnant demand for technology, which is just a small illustration of the problem that demand for technology does not emerge automatically with growth and recovery.

I have looked in some depth at the innovation capacity of EE economies. I cannot go into too much detail here because of the time. However, I want to highlight that in many aspects of innovation capacity there is no East-West division, because there are countries such as Greece, Portugal, Spain, even Italy in some respects, that have similarities with the countries of central Europe. So in this context, I would argue that there are three Europes (left hand figure in the slide below). But there is one dimension of national innovation capacity where you can see a clear East-West division: and this is in relation to the factors that determine demand for innovation. These darker shaded bars are EE countries, the others are the old EU-15 countries.

How it is composed and the 25 indicators it is based on are too complex for me to describe in detail now.³¹ However, I include it to make the point that in many respects these countries have similar problems of deficient demand for innovation which may not be generated automatically with economic growth.

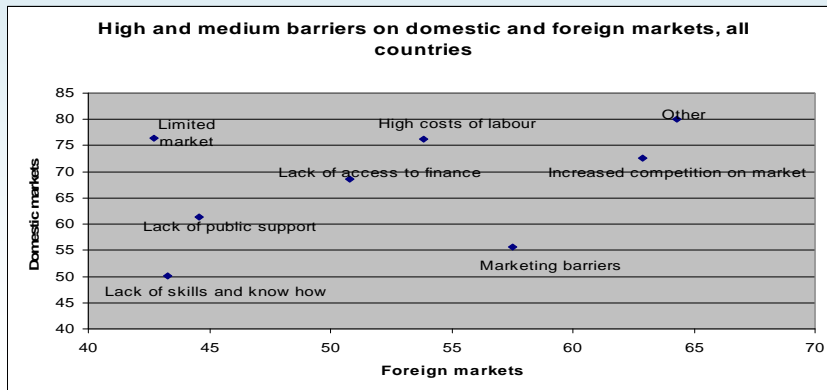


To illustrate this further, I want to demonstrate the importance of demand at the micro level, which is an area I am working on at the moment.³² Questionnaires have been received from 304 New Technology Based Firms (NTBFs) from 5 EE countries asking about their main problems and most important barriers in domestic and foreign markets? In foreign markets the main barriers are related to marketing and foreign competition. In the domestic market, the biggest problems are limited market demand and high costs of labour. Note that the firms are NTBFs, not ordinary firms.

³¹ See Radošević S. (2004) 'A Two-Tier or Multi-Tier Europe? Assessing the Innovation Capacities of Central and East European Countries in the Enlarged EU', *Journal of Common Market Studies* 42(3): 641-66.

³² Radošević S., Savić M. and Woodward R. (2008) 'Knowledge-Based Entrepreneurship in Central and Eastern Europe: Myth and Reality', Working Paper No. 93 (November). available at <http://www.ssees.ac.uk/wp93sum.htm>.

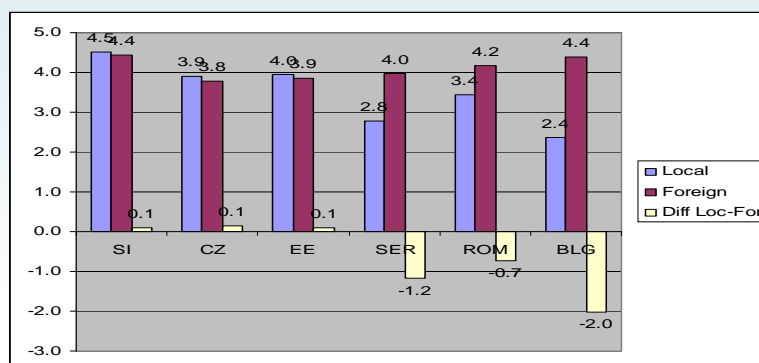
**Limited demand on domestic market for NTBFs
(240 firms in 5 CEECs)**



26

Then, in another project on software firms, we surveyed 224 software firms in 5 countries about the quality of their demand from local and from foreign buyers.³³ We asked which was more demanding? In the slide below, the lighter shading represents local requirements, and the darker shading foreign customers' requirements. So the situation is very good for Slovenia, Czech Republic and Estonia as the requirements of local and foreign clients are fairly similar. But in Serbia, Romania and Bulgaria, it can be seen that domestic clients are not sufficiently demanding, resulting in pressure to provide higher quality products and services is much less. This highlights this problem of demand: the more specific the demand from local buyers the greater the scope for interactive learning and, according to 'interactive dynamic capabilities approach', this increases the probabilities of technology accumulation.

Quality of local vs. foreign demand for firms' products and services: 224 software firms in five CEECs

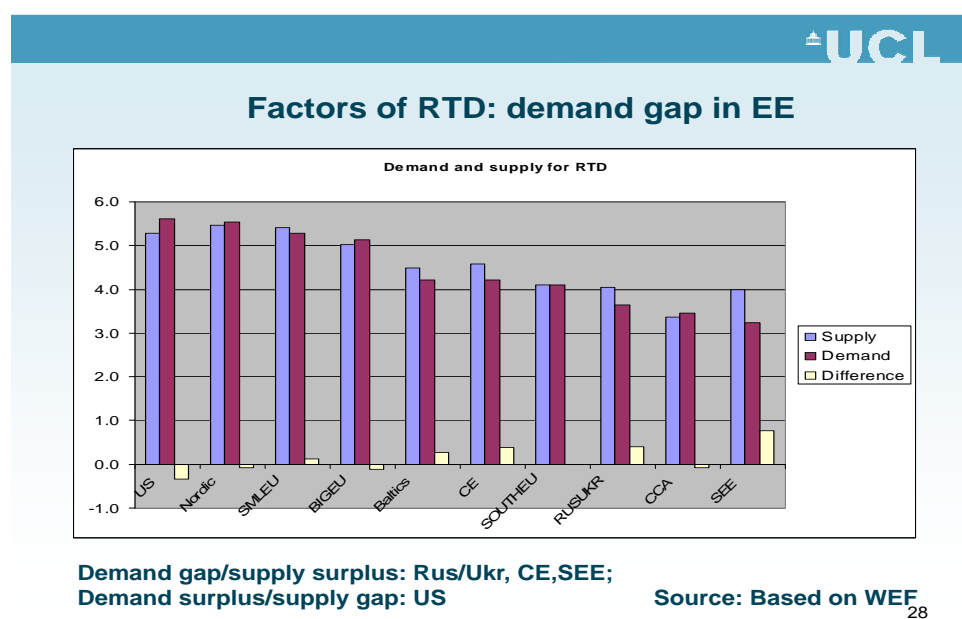


Demand constraints are significantly bigger in poorer countries

27

³³ Radošević S. (2006) 'Growth, Integration and Spillovers in the Central and East European Software Industry', *UCL SSEES Working Paper No. 69*, December, available at <http://www.ssees.ac.uk/wp69sum.htm>.

On a much higher level, the next slide shows figures from the World Economic Forum (WEF) for levels of supply and demand for research, technology and development (RTD). And the slide after shows the indicators used to get averages of demand and supply for RTD. These are based on subjective data, but the large size of the WEF sample ensures some degree of objectivity. My interest is in the relative importance of factors of supply or demand for RTD. I draw attention to this to show that in all EE countries we see that the supply of RTD is ranked higher than demand. So EE has a major problem of weak demand for RTD.³⁴



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- #### Legend
- **Supply**
 - Availability of scientists and engineers
 - Quality of math and science education
 - Local availability of specialized research and training services
 - Quality of scientific research institutions
 - Quality of public schools
 - Quality of the educational system
 - **Demand**
 - Degree of customer orientation
 - Firm-level technology absorption
 - Buyer sophistication
 - Production process sophistication
 - Extent of staff training
 - Capacity for innovation
 - Company spending on research and development
 - Government procurement of advanced technology products

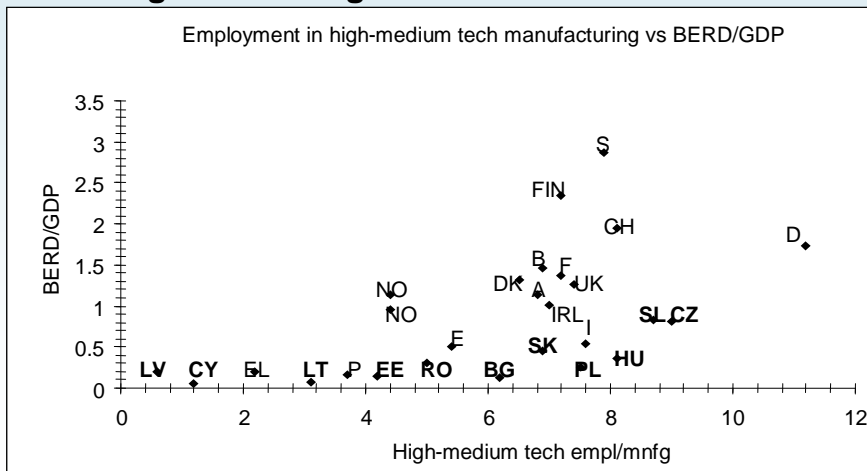
29

³⁴ For analysis of this approach in the context of South Eastern Europe see Radosevic S. (2009) 'Research And Development and Competitiveness, and European Integration of South Eastern Europe', *Euro-Asia Studies*, 61(4): 621-50.

Pattern of integration into global industrial networks

I want to close this part of my lecture by examining how these countries become integrated in global industrial networks. This is important because the way that countries integrate into global economy is an important driver of growth. Here we have a situation which I think is typical of EE.

Integration in global economy through low value added segments of high/med-tech sectors



The above slide shows the share of employment in high and medium high tech manufacturing sectors on the x axis and business R&D on the y axis. I compare EE countries (in bold type) with other European countries. And when I look at the shares, I see Hungary, Oh, above 8 per cent share of employment in medium high tech sectors. Very good! And compared to Sweden, Sweden and Hungary have similar shares of employment in hi-tech manufacturing. Fantastic! So what is the problem? The problem emerges when you look at business expenditure on R&D in relation to GDP: then Hungary ranks very low, while Sweden shows a very high share of R&D in GDP. So what is going on? Well this suggests that EE countries are integrated in low value added segments in high tech sectors. So, they are in high tech sectors which should be a good basis for growth, especially for Hungary in electronics. But then, a Czech colleague, Martin Srholec, showed that the R&D intensity of Central Europe

countries' electronics is lower than average manufacturing R&D intensity.³⁵ So, there is participation in the electronics sector, but it is not actually R&D and technology intensive electronics. It is activity in a low value added segment of this high tech sector. So although this may be better than participation in a low tech, and is a way of participating in the global economy since countries have to start from somewhere, it sheds a light on the nature of EE integration.

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Production capability (quality): the key source of competitiveness confined on subsidiary, parent company and value chain partners (suppliers, buyers)

| CEE-5 | Areas and sources of competitiveness | | | |
|--------------------------|--------------------------------------|-------------|---------------------|------------------------|
| | Quality control assistance | Management | People and training | Patents, licences, R&D |
| Own company | 0.82 | 0.79 | 0.72 | 0.50 |
| Foreign parent | 0.61 | 0.66 | 0.5 | 0.57 |
| Other foreign buyers | 0.55 | 0.35 | 0.29 | 0.31 |
| Other foreign suppliers | 0.51 | 0.3 | 0.26 | 0.3 |
| Other local subsidiaries | 0.23 | 0.21 | 0.19 | 0.16 |
| Other local buyers | 0.52 | 0.36 | 0.3 | 0.28 |
| Other local suppliers | 0.52 | 0.32 | 0.29 | 0.28 |
| Other organisations | 0.35 | 0.32 | 0.35 | 0.31 |

Sample: 460 subsidiaries in 5 CE countries 32

And the last piece of evidence here is from a project I was involved in, based on 460 FDI subsidiaries in 5 EE countries. So these enterprises are the cream, because they are the subsidiaries of foreign firms. We asked them what was crucial for their competitiveness - quality, management, people training, or R&D? We also asked who were the most important actors for their activities – their foreign buyers, their foreign suppliers, their foreign subsidiaries, their local suppliers, their global suppliers, or other organizations. The figures in the slide above show the importance of these actors. What emerges from these data is that what matters for enterprises is what they are doing, what their foreign buyers are doing, what their buyers and suppliers are doing, and especially what they are doing in terms of quality. So, enterprises are dependent on their parent companies and their suppliers and want to please their buyers and this is the source of productivity improvements. Productivity improvements come from participation in a value chain that enables entry to the global economy; the firms involvement is still in terms of production capability and the quality.³⁶

³⁵ Srholec, M. (2006) 'High-tech Sector in Central Europe: Is it a Real or Statistical Effect?', in K. Piech and S. Radosevic (eds), *The Knowledge-based Economy in Central and Eastern Europe: Countries and Industries in a Process of Change*, London: Palgrave, pp. 57-78.

³⁶ Further on this see Majcen B., Radosevic S., Rojec M. (2009) 'Nature and Determinants of Productivity Growth of Foreign Subsidiaries in Central and East European Countries', *Economic Systems*, 33: 168-84 and Majcen B, Radosevic S. and Rojec M. (2006) 'FDI Subsidiaries and Industrial Integration of Central Europe: Conceptual and Empirical

Systems of innovation and growth in CEE/CIS: a summary

- Weak firm specific capabilities: a key weakness of NIS in EE
- Growth (so far) is based on production capability (i.e. on learning by doing and learning by interacting confined on value chain), not on technology capability
 - Cf. FDI: direct effects are the most important; positive vertical spillovers; weak or negative horizontal spillovers
- R&D: not general shift towards BES
- Global integration: CEEB > 'network trade' in low VA segments; CIS: still outside 'network trade'
- 'Broad' NIS: local demand as one the key constraints
- Mismatches between and weaknesses in different NIS subsystems (BES, R&D system, FDI – local firms; large - SMEs)
- *Spurt*: 'static isolated competencies/capabilities' => *Catching up*: dynamic interactive capabilities

33

I would like to summarize my argument so far before moving to the political economy dimension - I am running out of time! So, what are my main points.

First, it seems that weak firm specific capabilities are the key limitation in the innovation systems in EE. Growth so far has been based on production capability, which means it is based on 'learning by doing' and by interacting with buyers and suppliers, which in the main confirms what economists have found in econometric research on FDI – the results are compatible.³⁷

Second, it seems that in general, R&D has not shifted towards the BES – we see that R&D is still extramural to the enterprise, which is not a good sign for long-term growth. In terms of global integration, we see that countries are integrating in low value added segments, but through intra-firm networks, something that economists call 'network trade'.

Third, we find that one of the key constraints to technology upgrading is local demand, and especially quality of demand.

Fourth, the logic of our conceptual model would suggest that growth emerges as a (mis)match between different social and economic subsystems, between the business sector and public R&D, between large firms and small and medium sized firms, between foreign and local firms, etc. So, 'catching up' as distinct from 'growth spurts' requires the development of 'dynamic interactive capabilities'. A 'growth spurt' is characterized by weak individual learning mechanisms or by weak alignment between different learning mechanisms. As alignment takes place through both 'pure markets'

Results', in D.A. Dyker (ed.) *Closing the East-West Productivity Gap: Foreign Direct Investment, Competitiveness and Public Policy*, London: Imperial College Press, pp. 35-70

³⁷ Here I refer to econometric work on FDI spillovers which confirms the importance of vertical spillovers i.e links with buyers and suppliers and weak horizontal spillovers. For an overview of this literature see Jindra B. (2005) 'Empirical Studies: Approaches, Methodological Problems and Findings' in J. Stephan *Technology Transfer via Foreign Direct Investment in Central and Eastern Europe*, London: Palgrave – Macmillan, pp. 6-57.

and networks and is heavily influenced by the institutional set-up, our approach remains basically one of systems of innovation.

Now from an innovation studies point of view this could be the end of the story. But I am not happy with that.



I want to introduce a political economy dimension. And I want to start with a particular kind of model. Consider two patterns of modernization - one 'foreign led modernization', which means that you quickly integrate in terms of market and production integration, you are open to FDI. What is the result? Rapid productivity improvements in production, in operations. For example, the productivity of Hungary's subsidiaries is similar now to the productivity of Austrian firms. These productivity improvements are accompanied by significant expansion in volume. So, this growth emerges through exposure to global markets via FDI. That's fine. But is there a downside? Trying to upgrade and expand within that network is not a trivial task; this is evident from actual case studies³⁸. So, functional/technological upgrading is limited. Having achieved the level of a very profitable supplier it is difficult to move beyond this, because this represents the greatest demand. And, finally it is difficult for a subsidiary to change its mandate. In most cases, subsidiaries' mandates do not change and local networking is limited. The overall result is high short and medium term growth, but potential structural weakness in the long term.

³⁸ For example see: Denis Eylem Yoruk (2002) '*Patterns of Industrial Upgrading in the Clothing Industry in Poland and Romania*', UCL Centre for the Study of Economic and Social Change in Europe: Working Papers No. 19, March, <http://www.ssees.ac.uk/wp19sum.htm>; Slavo Radosevic and Deniz Eylem Yoruk (2001) '*Videoton: The Growth of Enterprise Through Entrepreneurship and Network Alignment*', UCL Centre for the Study of Economic and Social Change in Europe: Working Papers No. 3, June: <http://www.ssees.ac.uk/wp3sum.htm>

Modernisation trade offs

Foreign led

- Quick international market and production integration
 - Fast productivity improvements in production (operations)
 - Significant expansion in volume
- vs.
- Reduced strategic autonomy
 - Limited functional / technological upgrading
 - Unchanged subsidiary mandate
 - Limited local networking



- Fast growth in short term but potential structural weakness in a long term

Domestic led

- Broad strategic autonomy
 - Full functional autonomy
 - Local networking
 - 'Preserved' NIS
- vs.
- Limited international market and production integration
 - Slow productivity improvements and low efficiency
 - Slow expansion in volume
 - Poor operational performance
 - Potentially high rent seeking costs and 'waste'



- Slow productivity growth in short term but structurally potentially more advantageous situation

35

Consider an alternative model, which I call 'domestic led modernization'. Here you have broad strategic autonomy - because foreigners are kept at arm's length. There is a full functional autonomy because all functions are still within the system. There are still local production networks or what has been preserved of these networks. And there is even a national innovation system – for example, in Russia, all the organizations of the national system of innovation are still there. Huge numbers of people are working there and you have the impression that everything is operating. Of course, if you delve more deeply you find that many of the organizations exist only in name or with significantly changed functions. This is a post soviet story that is full of interesting puzzles³⁹. But, I would say that this is the good side to the story. So what are the downsides? There is limited international market and production integration, so the 'learning by exporting', 'learning by cooperating' with partners is to a very limited extent. There are slow productivity improvements and low efficiency, slow expansion in volume and poor operational performance. An example is the Russian automobile industry. The old production network has been preserved and is trying to produce a Russian automobile model that Russians will buy, but in an industry that effectively has been nationalized. So, this is the situation in domestic led modernization where we have potentially high rent seeking costs and 'waste' in the system. The overall result is slow productivity growth in the short term, but structurally and potentially the situation is more advantageous if modernization is achieved while keeping foreigners' at arm's length.

³⁹ For excellent accounts of post-Soviet world and the role of informal networks see: Ledeneva, A.V. (2006), *How Russia Really Works: Informal Practices in the 1990s*. Ithaca: Cornell University Press. And Ledeneva, A. (1998), *Russia's Economy of Favours: Blat, Networking, and Informal Exchange*. Cambridge and New York: Cambridge University Press.

Inter country patterns of modernisation: outcomes of country/sector specific political economy

- Foreign led modernization in most of the sectors in central Europe (CE) vs. domestic led modernization in most sectors in European CIS (Russia, Ukraine) with eastern Europe (Romania, Bulgaria) being (temporary?) in an intermediate situation
- However, in none of the CEECs only one mode of modernisation dominates
- Pattern of modernisation is function of **F, M, T gaps and institutional (political) factors** > a co-evolution of technology and institutions

36

You will understand that I am hinting here at differences between Russia and central Europe. But the situation is not so simple. Of course there is foreign led modernization in most of the sectors in central Europe; there is domestic led modernization in most sectors in Russia and Ukraine, and Romania and Bulgaria are probably somewhere between. But we cannot say that one pattern of modernization dominates the other in any of the EE countries. This is because the pattern of modernization is determined by both political forces and the nature of the technology gaps, the market and the finance gaps. So, my argument is that the final outcome is the result of coupling or co-evolution of different gaps and institutions. What do I mean by this?

I can use an example to make this clearer (see slide below). There are two sectors, one is software, which has a growing domestic market. Everyone needs computers and software. And in terms of finance – there is no large financial requirement for customized software. For example, a Polish entrepreneur can raise the money for an information and communication technology (ICT) venture from the stock market. So finance is not a major problem. Technology is not a problem because it is accessible through international cooperative agreements. Big ICT companies need local customizers and are willing to share their technology. So that is not an issue. So, two of three of the gaps are under control and the third gap can be bridged by trading technology for market access. As a result, there is a presence of domestic firms in sectors such as customized software, and elements of domestic led modernization. And this applies to all EE countries.

**Foreign/domestic led modernisation is industry specific:
barriers to entry**

| | Software | Telecoms |
|-------------------------|---|--|
| Markets (demand) | Growing domestic market; | Growing domestic market |
| Finance | No large finance required for customized SW; Finance as a problem in complex projects and standardized SW | Large finance requirement |
| Technology | Technology accessible through ICA; Competitive advantages of domestic firms in customized SW; Technology gap in standardized SW | Huge technology gap in telecom equipment |
| Overall pattern | <i>A visible presence of domestic firms in customized SW</i> | <i>A strong presence of foreign network organisers</i> |

37

The second sector is telecoms, where there is also a growing market. People need telecommunication in the form of fixed and mobile telephones, etc. but here the financial requirements are large, and we are talking here of billions of euros, which it is not possible to raise in the domestic market. In addition, there has been a huge technology gap – sometimes 10-20 years. And the result is a strong presence of foreigners which does not apply to all countries because there is still political resistance to surrender telecoms to foreigners in countries such as Slovenia where the technology gap is the smallest of all the EE countries, and Russia, which is sufficiently strong to at least bridge some of these gaps. So we have a picture of two patterns with technological, market and financial elements mixed up with political aspects.

Central Europe: tendency towards foreign led modernisation, except in Slovenia

- In all CE countries state actors tried actively to promote the emergence of a domestic ownership class ('national capitalists') by subsidizing the sale of state owned assets ... results ... meagre?
- All CE have eliminated obstacles to FDI (incl. Slovenia after 1998)
- Strong external pressures for foreign led modernisation
- Constraints in terms of F, M and T have reduced bargaining power of the CE

38

The tendency, therefore, generally has been towards 'foreign led modernization' in central Europe. But we should remember that at the beginning of the 1990s, all central European countries tried to establish domestic control. For example, Hungary

proclaimed a policy to support 16 ‘national champions’. What was the result? Well, not much because the market, technology and finance gaps were too huge. We also need to consider the EU and the whole political context – strong external pressures for ‘foreign led modernization’ - and constraints in terms of finance, markets and technology.

Russia: strong tendency towards domestic led modernisation

- Local political class has created opaque institutional environment which deter FDI
- Business groups have locked out foreign capital or have improved terms of their bargaining with foreign capital (1992-1999)
- ‘Thick’ local network which can ‘lock out’ investors...Foreign investors need locals to enter’ (Lankes and Venables, 1997)
- A key bargaining strength of locals is their “local knowledge” (Kock and Guillen, 2001; Henderson, forthcoming)

39

In Russia, the tendency is towards ‘domestic led modernization’. What happened in Russia during the 1990s was that the local political classes created an opaque institutional environment, which deterred FDI. In addition, it was in the interests of the domestic business class to make the local business environment non-transparent⁴⁰. And this effectively ‘locked out’ foreign capital, which could not enter the local market without locals.⁴¹ So, this improved the bargaining terms with foreign investors.

One of my PhD students is exploring this in the context of the Russian oil industry and is coming to the nice conclusion that the key bargaining strength of locals is their ‘local knowledge’, because it makes foreigners dependent.⁴²

⁴⁰ On how specific institutional environment of Russia has affected its entrepreneurship see Aidis,R., Estrin,S., Mickiewicz,T. (2008). Institutions and Entrepreneurship Development in Russia: A Comparative Perspective. *Journal of Business Venturing* 23, 656-672

⁴¹ Lankes, H. P. and T Venables (1997) ‘Foreign Direct Investment in Economic Transition: The Changing Pattern of Investment’, *Economics of Transition* 4(2): 331-47.

⁴² Henderson J. (2009 forthcoming) ‘*Bargaining with Foreign Investors in a Weak State Environment*’, PhD thesis submission, School of Slavonic and East European Studies, UCL.

Russia: From 'market friendly' towards 'heavy handed' DLM

- Putin before Yukos: a more a 'market friendly' DLM
 - 1999-2003: trend among large firms towards good corporate governance
- Putin after Yukos denotes a stage of 'heavy hand' DLM accompanied by strong industrial/technology policy
- Past political struggle in Russia could be interpreted as fight between DLM vs FLM
 - State re-imposes its control in gas, oil, aluminium, diamonds etc
 - Vs. Russians companies are 'going global' + pressures of growth and modernization (cf. Gazprom investments)
- 2004> state starts to dominate ?

40

As the situation in Russia changes, one could argue that there is a shift from 'market friendly' towards heavy handed 'domestic led modernization'. Putin before the Yukos affair could be described as more market friendly evidenced by the trend among large firms towards good corporate governance. After Yukos, we have a stage of 'heavy handed' domestic led modernization accompanied by strong industry and technology policy into which Russia is pouring billions of euros. So from this perspective, the political struggles in Russia can be interpreted as a fight between 'domestic led' and 'foreign led modernization' through the imposition of control on gas, oil, aluminium, diamonds, and so on. But we should not forget that Russian companies also have to go global. This imposes limits on which domestic foreign led modernization pattern can be followed. Because eventually you need foreigners to bring technology, to co-finance these huge projects. So, the question remains, as to what will be the role of the state?

I want to conclude with two final slides. What I have tried to show you here is that growth within a system of innovation perspective is focused on these elements (see slide below): the mismatch between different systems; the variety of learning mechanisms on the supply and demand sides; and what is happening with capabilities at the level of enterprises. Of course, systematic application of what I have outlined would require in-depth country, industry and firm studies – it would require a whole project. And I hope I will be able to follow with that in the future. But what is it that makes current growth in EE look more like a spurt than catching up? From a systems of innovation perspective it is the missing learning mechanisms, and missing complementarities between them. The most important missing current complementarity is the coupling between domestic and foreign led modernization. Why – because there is no example of catching up in the world that has not combined these two patterns. They are combined in different ways – e.g. Japan and Korea, but their coupling is indispensable. No country can grow based only on domestic capabilities. And there are limits to how much growth can be achieved based only on 'foreign led modernization'. So my argument is that each of these extremes will ensure medium term growth, but will soon be exhausted. The critical issue is how to realize the complementarities between these two patterns which will promote and not

undermine endogenous technological capability, which is essential to growth.

Conclusions and policy issues

- Growth in SI perspective:
 - favourable (mis)matching between different social subsystems (network alignment)
 - variety of learning mechanisms on supply and demand side
 - enterprise: governance (cf. privatization) > capabilities
- A systematic application of this framework would require in depth country/industry/firm studies.
- What makes current growth to look more like spurt rather than catching up: missing learning mechanisms and complementarities?
- The most important current complementarity is coupling between domestic and foreign led modernization

41

So why is coupling so difficult? It is difficult because it is about matching the different layers of integration – financial system, market system, production, technology – because these systems do not align automatically. This then proves the aptness of the phrase, that when we have catch-up it does not rain, it pours. This is why this process is not linear, it does not happen in marginal moves; it is non-linear and passes thresholds or critical points of alignment between different subsystems.

Catching up: complementarities between domestic (DLM) and foreign led modernisation (FLM)

- DLM, which is based exclusively on domestic technologies and capabilities, has become increasingly unviable option
- FLM alone could ensure 'spurts' in growth but only coupling between FLM/DLM could ensure 'catching up'
- The critical issue is how NIS manages *complementarity* between FLM and DLM so that it promotes rather than undermines endogenous technological capability
- Why coupling is difficult? Matching different layers of integration (finance, market, production, technology) does not emerge automatically = network failures > network alignment

42

In policy terms, we are talking about different types of actions: FDI for the value chain, and innovation policy focused on the national innovation system. In conceptual terms, the coupling between foreign and domestic led modernization would require a coupling between FDI/value chains and innovation or national system of innovation policy.

However, in practice these two policies are usually separate. You might describe it as one hand not knowing what the other is doing. FDI policy is divorced from other policies for national innovation systems. The latter are usually focused on R&D and high tech. What would that mean in the case of Estonia, for example? It would mean that the ‘audience’, the policy clients, would be only a handful of high-tech firms, with most firms outside its scope. Thus, there is a gap between the nature of innovation policy, which is high-tech/R&D oriented, and the actual path of technology upgrading in local firms. Also, innovation policy is not integrated with FDI policy. Yet, the coupling between foreign and domestic led modernization requires the integration of these two policy areas. This is essential to enhance the synergies, positive vertical and horizontal spillovers and interaction among local technology efforts and foreign technology and knowledge providers.

Key policy challenges

- Value chain vs. NIS: how to reconcile and integrate two policies?
 - FDI: marketing country for FDI
 - Innovation policy: exclusively R&D/high tech focus
- Russian industrial policy does not offer leverages or coupling with foreign capital; it is focused on large RTD projects which offer limited learning by interacting
- CEE: dangers of ‘surrogate modernisation’ of long 19th century + interaction with Structural Funds and with the EU core to enhance endogenous TC

43

In this context is Russia doing well? Well, Russian industrial policy is extremely strong in terms of the large sums being invested in various programmes – the smallest Russian programme is 400 million euros. Russia is investing in nano-technology similar amounts as is the EC. But Russia’s industrial policy does not enable leverage or coupling with foreign capital. It is focused on large RTD projects, but they offer limited ‘learning by interacting’. Its outcomes are mainly intermediate, such as papers, patents, models. This ‘big push’ policy may be not the most effective route as it does not enhance the coupling between foreign and domestic technology efforts.

So where does central Europe stand? As I get older I read more history and this is showing me that we are seeing perhaps a repetition of something that Berend and Ranki⁴³ describe in their account of so called ‘long 19th century’. This was a kind of transition period as countries moved from feudal to bourgeoisie systems. And there was an idea that institutional changes would be sufficient to modernize, i.e. there was process of ‘Europeanization’ of EE. Well we can see now that it was ‘superficial

⁴³ Berend T.I. and Ranki,G. (1982) *Industrialization and the European Periphery 1780-1914*. Cambridge, New York.

modernization' or modernization only in appearance. I think there are similar dangers today. There is a danger that everything will look like the developed EU (i.e. there will be strong institutional convergence), but the reality will be nothing like it. Therefore, what use these countries make of EU Structural Funds is very important. However, as in the past, what these countries do is not all that matters. What is also important is what the EU and what multinational firms do and how this interaction develops. This is happening now, and we can bear witness to the the successes and failures.

Thank you very much.